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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 27 JUNE, 1944 NUMBER 6

THE EXOPHTHALMOS OF HYPERTHYROIDISM

A DIFFERENTIATION IN THE MECHANISM, PATHOLOGY, SYMPTOMATOLOGY, AND TREATMENT OF TWO VARIETIES*

Part I

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INTRODUCTION

It is hoped that this paper dealing with the differentiation of the exophthalmos of hyperthyroidism into two varieties will prove of some interest to those concerned in its study. Particularly worthy of consideration is the corollary implied in the possible existence of the distinction; namely, the inference that each variety of proptosis constitutes merely one important feature of two unrelated and separate diseases hitherto included under a number of terms in the literature although mostly being confused with thyrotoxicosis.† The general application of the latter term to all and sundry forms of hyperthyroidism is partly responsible for the anomaly as the practice tends to obscure the apparent circumstance that, while all varieties of thyrotoxicosis are hyperthyroid, not all instances of hyperthyroidism are examples of thyrotoxicosis. Elsewhere it has been pointed out (Mulvany, 1943) that the various forms of hyperthyroidism occurring spontaneously in man fall into three main categories, thyrotrophic, thyrotoxic, and thyropathic. The first, depending upon pituitary control, is familiar as a physiologic and pathologic occurrence in the latter third of pregnancy and in acromegaly, respectively. The second is exemplified in exophthalmic goiter, a compound expression of hyperthyroidism and sympathicotonia maintained apparently independently of thyrotrophic activity; and the last, arising from local disease of the thyroid gland, is often seen, usually in a transient form, in the early phases of neoplasm or infection or in lymphadenoid goiter. It is expedient for an improved understanding of the problems connected with hyperthyroidism that its composite pathogenesis should be appreciated.

Of these several varieties of hyperthyroidism, two only appear generally to be associated with exophthalmos; namely, thyrotoxicosis proper and one form of thyrotrophic origin. The latter results from increased thyrotrophic activity; but the absence of exophthalmos in pregnancy and acromegaly makes it evident that thyrotrophism *per se* does not lead to proptosis. There is evidence to suggest

* This paper was accepted May, 1938, by the Royal College of Surgeons for the purpose of a Hunterian lecture delivered in February, 1939. A few additional remarks relating to more recent observations have been included.

† The term thyrotoxicosis is used in this paper synonymously with Basedow's disease, Graves's disease, exophthalmic goiter, and diffuse, toxic, or hyperplastic parenchymatous goiter.

that another factor, the coöperation of certain sterones, is also essential for the development of exophthalmos in experimental thyrotrophic hyperthyroidism, and it may be assumed on reasonable grounds that the equivalent disorder occurring spontaneously in man possesses a similar pathogenesis. Should this assumption prove correct, the process indicates probably a disturbance of thyroid and sex secretions, as sex function is greatly influenced by certain types of steronic activity; but further work is required to elucidate this problem. The present paper, however, is not concerned with the general considerations of pathogensis but will deal only with the differentiation of the proptosis occurring in this disorder from that associated with exophthalmic goiter.

Historical note

It is well over 100 years since the attention of the medical profession was directed for the first time to the problem of exophthalmos occurring in association with an enlargement of the thyroid gland. The credit for this discovery is often ascribed to Basedow (1840), although it has been established that the condition was described some years earlier by Parry (1776) and Graves (1835). The anomaly may be explained possibly on the ground that the account given by Basedow was the fullest in point of original observation, particularly in connection with the exophthalmos. Nevertheless, the discoveries of these three observers were independently made and all are therefore deserving of an appreciation by posterity; although, as Osler has remarked, the account left by Parry was so complete and original that it more justly entitles him to the honor of the discovery of exophthalmic goiter than does that of the others.

Be that as it may, the first published explanation of the mechanism thought to be responsible for the development of the exophthalmos came from the pen of Basedow. This feature, so pronounced in one of his cases that both eyes were lost, was considered by him to be produced by a "strumous hypertrophy" of the retrobulbar cellular tissues, not due to edema or fat, but possibly similar in nature to the morbid process responsible for the association of those peculiar swellings known as areas of "localized myxedema." This interesting observation, based apparently on clinical surmise, was not supported by pathologic evidence, and today it is well known that examination of the orbit at autopsy in the typical case of Graves's disease discloses no indication of increased retrobulbar pressure. The remark, however, is of special interest in view of the recent revival of the theory of *propulsio bulbi a tergo* occasioned by reports of a progressive type of exophthalmos, associated in about half the cases with hyperthyroidism, in which the proptosis has been due unquestionably to increased intraorbital pressure. The majority of these cases have been labelled exophthalmic goiter, but numerous other diagnoses, ranging from idiopathic aseptic thrombosis of the cavernous sinus to polyglandular disturbance, and from exophthalmic ophthalmoplegia to idiopathic myositis of the extraocular muscles, have been attached. These varied opinions are in contrast to the singleness of the pathologic and clinical features which in their uniformity contribute strong support for believing the condition to be distinct from exophthalmic goiter.

Following the pioneer work on the subject, the growth of knowledge and interest progressed smoothly. Shortly after the publication of Basedow's famous article, there appeared a report by Cooper (1849) containing an explanation of the mechanism which produced exophthalmos. The suggestion was that the proptosis depended upon two factors; namely, an ab-

sence of the proper tonicity of the muscles which served to retain the eyes in their natural position in the orbit, and the presence of venous congestion of the retrobulbar cushion confined to the tissues therein and not extending to the eyes. As with Basedow's idea, the theory is of interest because it appears certain that weakness of the voluntary eye muscles plays an essential part in the development of proptosis in exophthalmic goiter; and, indeed, if the presence and function of the unstriped musculature of the orbit had been known in Cooper's day, it is not unlikely that the mystery of the mechanism would have then been solved.

Role of unstriped orbital musculature

The experiments of Claude Bernard (1858), in which retraction of the lids and proptosis in rabbits were noted to follow stimulation of the distal cervical sympathetic nerve, and the publication by Müller (1858) of the anatomic work on the smooth muscle of the orbit gave a further stimulus to thought on the subject. Aran (1860) put forward the view that the proptosis of Graves's disease was produced by a contraction of the unstriped orbital muscle, an idea at first received with enthusiasm until it became known that stimulation of the cervical sympathetic in man did not cause exophthalmos although lid retraction and dilatation of the pupil were evident. Thus, Jaboulay (1898), Jonnesco (1897), and more recently Pochin (1939) convinced themselves on this point by practical experiment in the course of operations on the neck, and Müller (1861) and Wagner (1859) arrived at a similar conclusion by using the heads of newly decapitated criminals.

The first experiments on a more scientific basis intended to solve the problem were carried out by MacCullum and Cornell (1904). These investigators exposed the orbit of the dog and found that this animal possessed a well-developed periorbital membrane which extended forward in the shape of a cone from the region of the optic foramen to the margins of the orbit. They demonstrated that this membrane contained a large amount of unstriped muscle and that protrusion of the globe followed stimulation of the cervical sympathetic which induced a wave of peristalsis to pass along the cone. Transverse section of the cone led the peristalsis to cease at the edge of the sectioned area and prevented the development of a proptosis. Similar experiments have been conducted by Code and Essex (1935) who confirmed the findings of MacCullum and Cornell and demonstrated also the presence of a rise of pressure within the fascial cone during the period of stimulation.

MacCullum and Cornell formed the opinion that "although no certain conclusions could be drawn from their work, the possibilities were perhaps more closely defined." It seemed, however, that there was a failure to appreciate the anatomic differences between the orbits of man and the dog, which are of such a type as to preclude the application of a common mechanism to both. In the dog, sheep, and certain other animals, the periorbital membrane forms a well-developed muscular structure characterized by a strength and mobility not present in man. The reason for this distinction lies in the fact that the bony socket in these animals is rudimentary, being formed by bone only on its inner wall, so that a strong periorbital membrane is essential. Hence it is not a difficult matter for a contraction of this powerful and mobile structure to give rise to proptosis. In the ape and man, however, the position is quite different, as the presence of a regular bony socket obviates the need for an additional muscular support.

In them, the periorbital muscular elements are vestigial and rendered still less effective in contraction by a close attachment to the orbital walls, a point confirmed by the fact that stimulation of the cervical sympathetic nerve in the ape, as in man, does not lead to protrusion of the globe. On this account it is safe to assume that the periorbital smooth muscle plays no significant part in the development of proptosis in exophthalmic goiter.

Thus it was that the unsatisfactory nature of the anatomic basis of the theory built around Müller's periorbital muscle led to a more thorough examination of the orbit, and in 1907 Landström was able to demonstrate by means of serial sections in three planes the presence of smooth muscle in the anterior half of the orbit. This took the form of a cuff surrounding the front half of the globe, being attached anteriorly to the back of the orbital septum and extending backward to the region of the equator of the eye, where it was inserted into fascial expansions given off by the recti muscles at their point of attachment to the globe. As a result of these investigations, Landström was able to state that this muscular cuff could by its contraction exert traction on the globe, and he ascribed the exophthalmos of Graves's disease to this factor. The theory, however, although anatomically sound, still failed to explain why stimulation of the cervical sympathetic in man does not produce proptosis.

It was evident, therefore, that some other factor was required to supplement the action of the orbital unstriped musculature, and in 1935 Plummer and Wilder demonstrated its nature. In a closely reasoned article, these observers were able to establish in exophthalmic goiter the existence of a positive correlation between the amount of myasthenia and the degree of exophthalmos present. They expressed the opinion that it would be possible for a spastic contraction of Müller's orbital muscle to produce exophthalmos in the presence of weakened recti muscles. Some criticism of this view is justifiable from the fact that Müller's orbital (better termed periorbital) muscle is hardly capable of influencing the position of the eye in any circumstances, but there is no reason why Müller's palpebral muscles and Landström's muscular cuff could not achieve this in the presence of a weakened voluntary musculature within the orbit. This aspect of the problem will be considered again later in connection with the discussion of the actual mechanism concerned in the production of the proptosis.

The role of the thyrotrophic hormone

While these theories concerning the part played by the unstriped musculature of the orbit were being developed, there began to appear in the literature reports of cases of progressive bilateral exophthalmos associated with peculiar pathologic changes in the voluntary ocular muscles. About half the cases were stated to have been accompanied by thyrotoxicosis, but in the others this was not noted or else its association was doubtful. The first of these cases to give rise to general interest was described by Foster Moore (1920). The patient, a woman aged 53 years, had a severe proptosis which resisted lid-suture and was still urgently in need of further treatment. The author thereupon exposed the orbit through the lower fornix and removed as much as a heaped-up teaspoonful of edematous fat, after which it became possible to approximate the lids. He noted that the recti muscles, instead of being thin flat ribbon-like structures were "greatly swollen fusiform bellies not quite so stout as the last joint of one's little finger." It was obvious that in this particular case the proptosis was due to retrobulbar pressure,

and the author concluded, in view of the unusual features, that a modification of this process was the probable mechanism responsible for its appearance in Graves's disease. The histologic examination of a portion of the inferior-oblique muscle, removed at the time, disclosed the presence of a certain type of morbid change which in recent years has become more familiar mainly through the writings of Burch (1929) and Naffziger (1933) and which has been associated clinically with a progressive and severe type of exophthalmos, often complicated by corneal ulceration and allied phenomena. A peculiar and common feature in many of these cases was that the condition had apparently been induced or accentuated by the performance of a thyroidectomy for the relief of hyperthyroidism, an aim successfully achieved.

Some light was shed on these events by the work of Schockaert (1932), of Loeb and Friedman (1932), and of Marine and Rosen (1933) who showed that hyperthyroidism with exophthalmos could be produced by an injection of pituitary extract containing thyrotrophic hormone. Naturally, the idea grew that the pituitary gland might be responsible, if not for Graves's disease, at least for the development of the exophthalmos. A great deal of work in this direction has been done without settling the problem, but the view relating to the pituitary genesis of the disease has gained strength. Nevertheless, caution is required in the acceptance of the hypophyseal theory, as there is strong evidence against it with little or nothing conclusively or incontrovertibly in its favor; so that the possibility of thyrotoxicosis being governed by some factor other than the thyrotrophic hormone should be borne in mind.

The most important contributions in support of the pituitary genesis of thyrotoxicosis are probably those of Smelser (1937) and Marine (1938). The former was able to examine the orbital tissues in certain patients thought to have Graves's disease and to compare the pathologic changes therein with those he had observed experimentally in the orbits of guinea pigs treated with thyrotrophic hormone. The results of his observations were sufficiently conclusive to enable him to say that the experimental type, with certain minor differences, closely resembled the clinical variety. The tissue response, including the muscle hypertrophy and edema of the connective tissue, was general and included the characteristic round-cell infiltration which has come to be recognized as an essential part of the pathologic picture. Further, Smelser stated that edematous infiltration of the retrobulbar tissues had been repeatedly demonstrated in, and presented as, the cause of exophthalmos associated with Graves's disease; a statement requiring modification, as the vast majority of orbital examinations at autopsy fail to reveal any such causative factor. However, as Smelser remarked, exophthalmos has been found with all ranges of basal metabolic rate and particularly extreme cases of the progressive variety have followed thyroidectomy when the basal metabolism was subnormal. The conclusion therefore drawn by this observer was that the mechanism of exophthalmos in hyperthyroidism and hypothyroidism was the same, although the thought that cases activated by a different mechanism, possibly sympathetic excitation, might exist.

Similar views are held by Marine (1938) who claimed that thyroid insufficiency, either relative or absolute, is one of two essential factors underlying the development of the exophthalmos in Graves's disease; by Brain (1938) who stated that in exophthalmic goiter the exophthalmos is not the result of hyperthyroidism, and more recently by Eden

and Trotter (1942) who concluded that the exophthalmos occurring in diffuse toxic goiter is extrathyroid in origin. Such views, so contrary to what is generally accepted in relation to the proptosis of exophthalmic goiter, depend to a certain extent on an idea that hyperthyroidism is a single entity; on a failure to perceive that all varieties of hyperthyroidism not being instances of thyrotoxicosis, the accompanying proptosis may not be consistently uniform in etiology; on lack of consideration that thyrotoxicosis, being fundamentally a hyperthyroid disease, the associated exophthalmos equally must be thyrotoxic in nature; and lastly on a faulty interpretation of the fact that while a certain variety of thyrotrophism may lead to hyperthyroidism and exophthalmos, the latter depends on the presence of the thyrotrophic hormone and not of the thyroid gland—hence its appearance with all ranges of basal metabolism. The true position is that the exophthalmos of hyperthyroidism may be either thyrotoxic or thyrotrophic, but the progressive proptosis of hypothyroidism can be only hypophyseal in origin.

The work of Marine is of great importance and enlightenment. In 1932, this observer, working in conjunction with others, noticed that exophthalmos associated with goiter developed in certain pubertal rabbits fed on a diet of alfalfa hay and oats or after a daily injection of 0.1 c.c. of methyl cyanide. The fact that the exophthalmos did not develop until large parenchymatous goiters had appeared and that such goiters were associated with hypertrophy of the pituitary body of the type seen after a thyroidectomy suggested there was a close relationship between thyroid deficiency and increased activity of the anterior pituitary and between the latter and the appearance of the proptosis. Indeed, in the above experiments and in guinea pigs treated with injections of anterior pituitary extract, removal of the thyroid gland was found to facilitate the development of the exophthalmos, a phenomenon capable of explanation on the ground that the injection process is supplemented by the stimulus to increased pituitary output induced by the operation.

Another highly important observation made by Marine was that a greater degree of exophthalmos appeared in those animals which were most active sexually. This prompted him to investigate the effects of cryptorchidism and gonadectomy on the development of the exophthalmos. His results showed that while cryptorchidism had no effect, gonadectomy caused a regression of the proptosis when present or prevented its appearance in others. Injection of the androgens, particularly of testosterone, effectively replaced the missing orchids but the estrogens were inert. These findings led him to conclude that the degree of functional activity of the interstitial cells of the testes was an important factor in determining the development of the exophthalmos and to formulate the view that "thyroid insufficiency (relative or absolute) and anterior pituitary hyperactivity appear to be two of the essential factors underlying the development of the exophthalmos of Graves's disease . . . and that an increase in the functional activity of the interstitial cells and possibly of the adrenal cortex is necessary." The apparent paradox in the statement follows the practice of accepting an experimental pituitary hyperthyroidism as being the equivalent of Graves's disease. It is quite certain that thyroid insufficiency is not a feature of thyrotoxicosis and that the degree of exophthalmos often bears some relation to the height of the metabolic rate. It may be recalled also that there is no evidence of pituitary overactivity in Graves's disease, the gland

often being small and sometimes atrophied, and the adrenal cortex may be degenerated and the gonads relatively inactive. Marine's remarks, however, can well be applied to the experimental variety of gonadothyrotrophism and his observations concerning the activity of the adrenal cortex become of special interest because it is possible that this structure may form the source of the essential sterone in women after the menopausal atrophy of the gonads.

Nevertheless, Marine's experiments are highly important because for the first time an explanation is offered to account for the absence of exophthalmos in the other varieties of thyrotrophic hyperthyroidism. As noted earlier, acromegaly and pregnancy are only very rarely accompanied by exophthalmos although the basal metabolism may be raised as much as 50 per-cent by thyrotrophic stimulation of the thyroid gland. In certain instances of myxedema, also, there is an increased amount of thyrotrophic hormone in the bloodstream, yet exophthalmos remains notably absent. It is patent, therefore, that the thyrotrophic hormone is only partly responsible for the development of the proptosis, and that some additional factor is also essential. The work of Marine affords grounds for believing this to consist of certain of the androgens. It is probable that the hyperthyroidism and exophthalmos induced by injections of anterior pituitary extract (which however purified contains gonadotrophin as well as thyrotrophin) are the outcome of an experimental gonadothyrotrophism and not of a simple thyrotrophism; and it is not unlikely that the equivalent state in man possesses a somewhat similar pathogenesis. Hyperthyroidism, a feature both of exophthalmic goiter and thyrotrophic exophthalmos, is relieved in each instance by a thyroidectomy; but the effect of the operation on the exophthalmos is different in the two diseases. In the first, the proptosis is relieved or not altered; in the second, it may remain stationary or become greatly increased in severity owing to the raised thyrotrophic activity of the pituitary gland resulting from the absence of the thyroid gland. Both experimentally and in man a rapid progression of the proptosis in the thyrotrophic variety may follow a thyroidectomy when the basal metabolism is often below normal, and this fact has given rise to the erroneous belief that hyperthyroidism is not an essential factor in the development of the proptosis in thyrotoxicosis and that the mechanism of the exophthalmos in both hyperthyroidism and hypothyroidism is similar. The true position is that hyperthyroidism is necessary for the appearance of the proptosis in thyrotoxicosis but in the thyrotrophic variety hyperthyroidism plays no essential part in its development although remaining an associated feature of the disease.

Such has been the history of events leading up to the present-day attitude in which the phenomenon of exophthalmos associated with hyperthyroidism is thought to possess a single pathogenesis. Observations in connection with the interpretation of the recent experimental work which has confirmed or conduced to this idea have also been included. It remains now to examine the possibilities of the differentiation of the two varieties of exophthalmos which for convenience have been termed respectively thyrotoxic and thyrotrophic, indicating thereby without claim to etiologic comprehensiveness an essential component of the pathogenesis.

Anatomic factors concerned in the maintenance of the normal position of the eye

Before consideration of the possible factors concerned in the development of exophthalmos in hyperthyroidism, it may

be useful first to examine the mechanism which normally maintains the eye in its natural position. Briefly, it is known that the globe is retained firmly within the capsule of Tenon by means of numerous fine trabecula stretching between the two structures and by various expansions which attach themselves to the tendons of the ocular muscles as they pass through its wall. The capsule itself is steadied by bilateral attachments to the orbital tubercles and is reinforced below by a thickening of its anterior portion, known as the ligament of Lockwood. All these structures serve to stabilize the position of the eye without affecting its range of movement. There are, however, other factors of a less fixed character which are capable of influencing the position of the globe. The following are the three most important:

I. *The tone of the voluntary ocular muscles.* These muscles consist of the four recti and the two obliques and their function is concerned with more than just eye movement. In the words of Whitnall (1921) ". . . The eye is delicately poised . . . and a state of equilibrium is maintained by the tone of the extraocular muscles. As a whole, the four recti may be regarded as retractors of the ocular bulb; they are antagonized by the obliques which, from their origins and the direction of their fibers, act as protractors and this is the active element maintaining the equilibrium of the globe." Rarely, the obliques are able to dissociate their power of contraction from that of the recti, allowing a state of voluntary exophthalmos to be produced. Normally, however, this dissociation is impossible and the combined tone of the recti muscles is sufficiently powerful to resist any tendency to proptosis, even in the face of most intense stimulation of the cervical sympathetic nerve. It is interesting, therefore, to recall that in certain conditions, such as myasthenia gravis and neurosyphilis, in which there may be an associated weakness or palsy of the eye muscles, exophthalmos may be present as a clinical feature. In thyrotoxicosis, the presence of ocular-muscle weakness is closely related to the development of the proptosis and yet more nearly to the disturbance of eye movement.

II. *The width of the palpebral fissure.* It is a well-known phenomenon that in normal people wide retraction of the lids may be accompanied by a slight degree of proptosis, due doubtless to a lessening of pressure on the anterior surface of the globe occasioned by the tonic contraction of the orbicularis oculi. The extent of exophthalmos which may follow this movement depends on the relative grades of tone existent in the sphincter and the retracting muscles, and it may be expected, therefore, that the phenomenon will be more readily seen in thyrotoxicosis, owing to the associated extraocular weakness. This is generally the case, and excellent illustrations of the fact are available in an article by Tilley (1926) in which an excursion of the globe to the extent of 4 or 5 mm. was noted to follow the maneuver. With the eyes closed or opened in normal fashion, very little exophthalmos was visible; but as the lids were widely retracted the eyeball moved rapidly forward and appeared to be protruded through the enlarged fissure. Hence, the width of the palpebral fissure in thyrotoxicosis often bears some relationship to the degree of exophthalmos, particularly when associated with lagophthalmos due to sphincter weakness.

III. *The bulk of the retrobulbar tissues.* Normally, the retrobulbar fibro-fatty tissue accommodates itself to the space within the extraocular cone of muscles, being equitably disposed to exert an even pressure on the rear of the globe. Slight alteration in the volume of this cushion may modify the position of the eye, as may be recalled from the hollow-eyed appearance associated with wasting or the bulging orbits of the obese alcoholic. In thyrotoxicosis, there is no real increase in the bulk of the retrobulbar tissues, as has abundantly been proved at autopsy, although the intraorbital fat may be more loosely spread and indeed increased in the degenerating muscles. Hence, in exophthalmic goiter, this factor plays no part in the development of the proptosis. On the other hand, the exophthalmos of thyrotrophic origin is produced solely by an expansion of the intraorbital contents taking place within the bony confines of the orbit.

Of these three factors therefore capable of influencing the position of the eye, it may be stated that in thyrotoxicosis the tone and strength of the recti muscles are of primary importance, the width of the palpebral fissure of minor character, and the volume of the retrobulbar tissues of no consequence at all. Conversely, in the thyrotrophic variety, the first two items exert no influence, the last-named factor

constituting the sole operative agency.

With these brief anatomic considerations in mind, the differentiation of the two types of exophthalmos will follow.

A. Thyrotoxic Exophthalmos: Its Mechanism, Pathology, Symptomatology, and Treatment

I. Mechanism of thyrotoxic exophthalmos

It may be remarked that the most important guiding observation in this respect has been the incontrovertible fact that in the numerous autopsies conducted on persons dying of typical thyrotoxicosis nothing very much of note has been discovered in the orbit. It is important to bear this fact in mind for there has been a tendency to overlook it, following the description of the orbital changes in animals consecutive to the administration of anterior-pituitary extracts and the discovery of identical findings in the human orbit in certain cases of progressive post-thyroidectomy exophthalmos. In both these states the proptosis unquestionably has developed in response to a raised intraorbital pressure, and it has been assumed in certain quarters that the exophthalmic mechanism in thyrotoxicosis is due to a similar morbid process. This assumption is erroneous. The development of pressure in the thyrotrophic variety is brought about by constant alterations in the eye muscles, comprising increased girth, edema, fibrosis, and round-celled infiltration. These distinctive features are absent in the thyrotoxic orbit, often there being no naked-eye abnormality. This definite and conclusive finding assists one to dispose of those theories in which the mechanism is based upon increased retrobulbar pressure. It may be emphasized that neither clinically nor pathologically is there ever anything in typical thyrotoxicosis to indicate that increased retrobulbar pressure is the cause of the proptosis, and it is of little value to consider any hypothesis which does not take this fact into account. Consequently the logical conclusion may be accepted that the responsible mechanism of the proptosis, not being governed by pressure from behind, must depend upon forward traction of the globe. Allusion has been made to two factors, sympathetic overaction and ocular-muscle weakness, which have been thought capable of producing exophthalmos in thyrotoxicosis. It remains now to examine their likelihood.

The sympathetic component. It has been maintained since 1858 that sympathetic overaction plays an essential part in the development of proptosis in thyrotoxicosis. This idea has grown because sympatheticotonia is a constant accompaniment of the disease; because experimental stimulation of the cervical-sympathetic nerve in animals has produced proptosis and lid retraction, and because the absence of an obvious mechanical or voluntary force implies the functioning of involuntary effort. Recently a suggestion that spasm of the levator palpebrae is responsible for upper-lid retraction has been made by Pochin (1939b) on the ground that the effects of stimulation of the cervical sympathetic in man, comprising dilatation of the pupil, retraction of both lids but not exophthalmos, are not seen in thyrotoxicosis. There is little evidence to support this view, and the relief of lid retraction sometimes following cervical sympathectomy is a strong pointer against the agency of striated muscle; at the same time the three points of distinction raised are capable of explanation. The main difficulty in ascertaining the part played by the sympathetic system has been to establish the anatomic basis of the mechanism involved; hence it is of some consequence to find that the unstriped

musculature of the anterior half of the orbit as described by Müller and Landström is suitably disposed to effect forward traction on the globe.

Landström's orbital muscle consists of a cone of unstriped muscle surrounding the front part of the globe. It extends from the back of the orbital septum anteriorly to the region of the equator of the globe, where it is connected to fascial expansions derived from the ocular muscles near their point of attachment to the eye. The muscle is widely distributed and of surprising strength, as may be gathered from a perusal of Landström's original work (fig. 1). The main fasciculi lie close to the globe and many are inserted directly into fascial investments of the ocular muscles. The muscle gains its power from the concentric arrangement of numerous bundles exerting a short direct pull.

Müller's palpebral muscles, not to be confused with Müller's orbital muscle, consist of small bands of unstriped muscle in the region of the lids and appear to comprise specialized portions of Landström's muscle. The superior muscle is the more important and corresponds in position to the middle division of the insertion of the levator palpebrae, stretching from the region of the tendon of the superior-rectus muscle to the tarsus, to which it is attached. Lid retraction in Graves's disease is attributed to spasm of this muscle, but the practicability of its contraction contributing to the development of the exophthalmos appears to have been overlooked. The effect, however, is conveyed to the upper pole of the globe through the intimate fascial connection which exists between the levator and the tendon of the superior rectus (fig. 2). The function of this band normally is to facilitate raising of the lid on elevation of

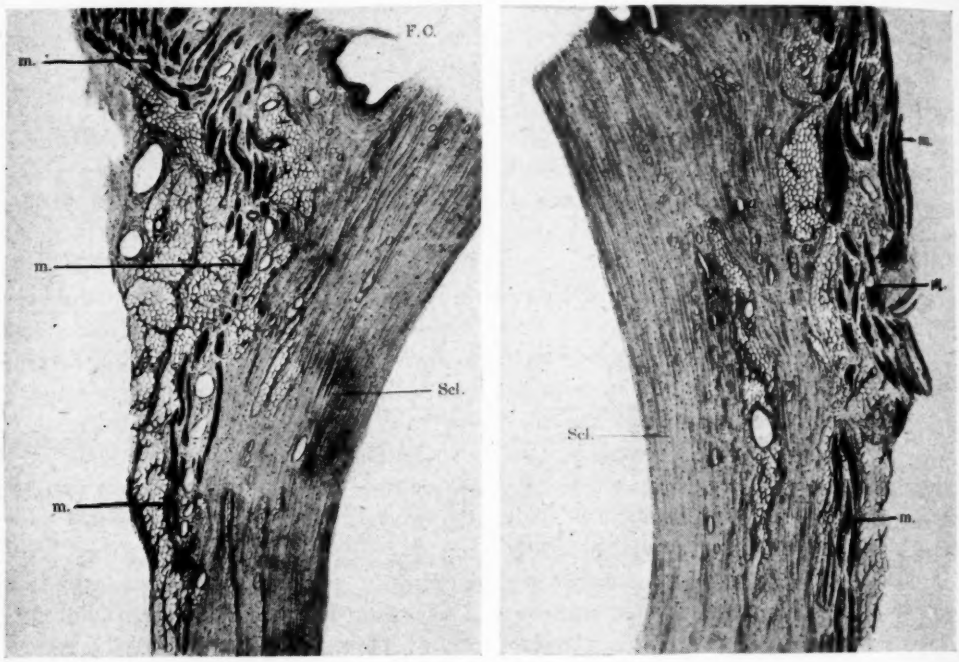

Fig. 1 (Mulvany). Landström's muscle. Sections from anterior orbit showing the extensive and close attachment of the smooth muscle (m) to the globe (Landström, 1907).

the eye, and its practical importance is emphasized in the lid retraction or ptosis which may follow recession or an advancement of the superior-rectus tendon, respectively. Spasm of the unstriped muscle in this position effects a pull between the tarsus and the point of insertion of the upper rectus; hence, in producing lid retraction, there is a tendency also to proptosis.

In the case of the inferior palpebral muscle, a more direct mechanism is apparent although the fibers are less well developed. The smooth muscle is contained in the fascial expansion from the tendon of the inferior rectus to the lower lid, the normal function of which is to assist depression of the lower lid when the eye is rotated downward. Spasm of these fibers exerts a direct pull between the tarsus of the lower lid and the under surface of the globe.

The tension of these small muscles of Müller is not insignificant, as may be gauged in certain instances when attempting approximation of the lids. Working in conjunction with Landström's muscle, the combination is able to effect a steady forward pull on the globe (fig. 3) and should be capable of producing all degrees of exophthalmos provided there is coincidentally sufficient impairment of tone of the voluntary muscles. It should be appreciated that the proptosis is achieved not by the active contraction of opposed sets of muscles but by the steady unflag-

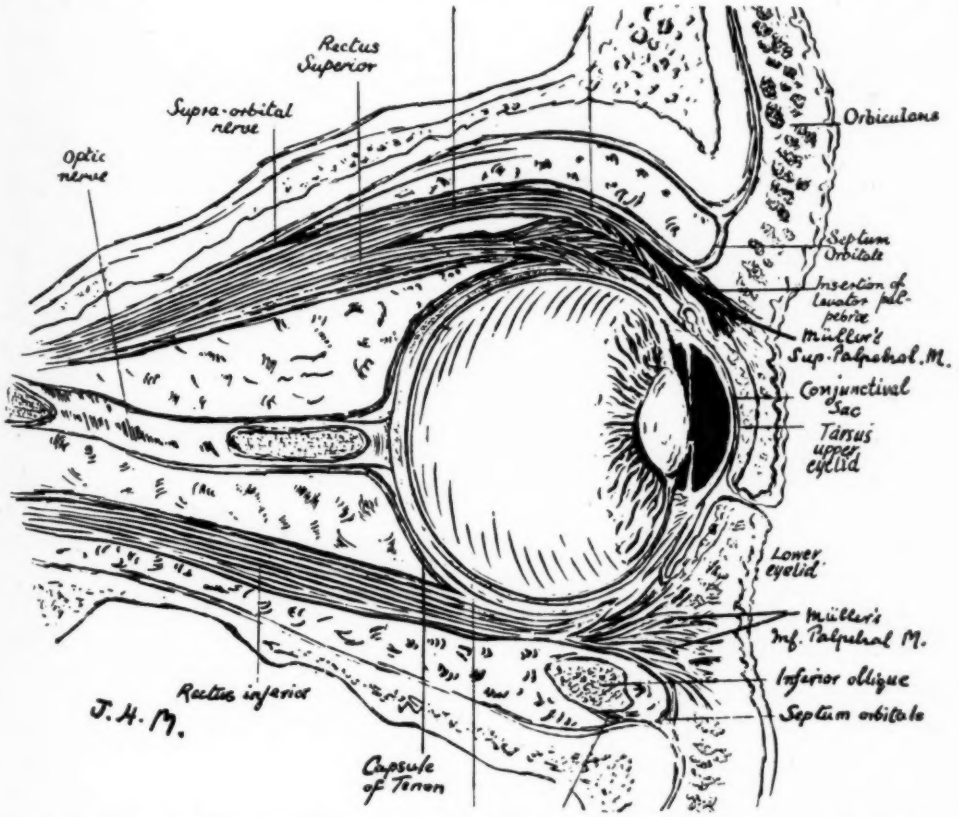

Fig. 2 (Mulvany). Sagittal section through orbit, showing Müller's palpebral muscles stretching between the lids and the tendons of the upper and lower recti muscles (semidiagrammatic).

ging pull of small, spastic fibers operating against weakened and hypotonic ones.

COMPONENT OF OCULAR-MUSCLE WEAKNESS. The possibility of weakness of the eye muscles as a factor in the mechanism

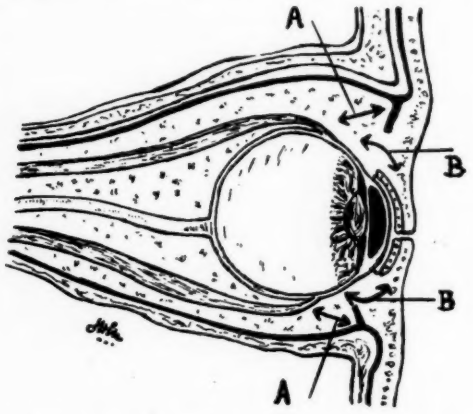

Fig. 3 (Mulvany). Diagram illustrating direction of pull of anterior orbital smooth muscle. A, Landström's muscle; B, Müller's palpebral muscles.

of thyrotoxic exophthalmos was pointed out in 1849 by Cooper. The idea has since presented itself to several observers, notably Moebius (1886), Lemke (1894), Sainton and Hesse (1931), and recently Plummer and Wilder (1935).

Generalized myasthenia, of which the eye-muscle weakness forms partly a local expression, is a fairly constant accompaniment of thyrotoxicosis, although in its mild form it may pass unnoticed by the patient and remain unrecognized by the clinician. Commonly it is manifested clinically by a variable amount of weakness of the quadriceps femoris or of the ocular muscles, but occasionally severe types are encountered in which the main disturbance may be noted in the limbs, giving rise to a paraparesis, as described by Charcot (1885), or in the muscles supplied by the cranial nerves, in particular those of the eye. In grave cases death may occur from bulbar asthenia. Hence it is not surprising to find these severe grades of thyrotoxic myasthenia erroneously spoken of as myasthenia gravis complicating exophthalmic goiter, a conclusion which overlooks the fact that myasthenia, whatever its cause, is no more than a symptom indicating a facilitation of the choline-esterase process at the neuromuscular junctions and does not constitute a disease in itself. Thus there are at least two other unrelated conditions which may present a typical picture of myasthenia gravis. For instance, the injection of an appropriate dose of curare into a vein induces a state of muscular weakness, initiated by diplopia and bilateral ptosis and followed rapidly by loss of power over the distribution of the remaining cranial nerves, weakness of the arms and legs, and finally by respiratory failure due to intercostal and diaphragmatic paralysis. The condition is relieved by an injection of prostigmine. In other words, "myasthenia gravis," rather *"acceleranda,"* can be reproduced by an agent known to interefere with the proper functioning of the myoneural junction and cured by another which restores its normal operation. Another example of typical "myasthenia gravis" not uncommonly occurs in connection with a tumor of the thymus gland, and it is not improbable that it also would be cured by the removal of the diseased organ.

The essentially thyrotoxic nature of the muscle weakness in exophthalmic goiter is shown in the relief afforded by a thyroidectomy or occurring during a remission of the disease. Thyrotoxic myasthenia, therefore, although presenting many similarities to myasthenia gravis, deserves to be distinguished from that condition. Points of difference are seen in the response to rest and prostigmine, which is reduced in effect and duration and may be absent in the case of the ocular palsies. The alteration is probably caused by the hypotonia and persistent weakness occasioned by the widespread degenerative process present in the muscles and nerves.

The eye muscles undoubtedly suffer in greater measure from the toxic agent than does the rest of the skeletal musculature. The reason for this selectivity is a matter for conjecture although it is possible to advance three suggestions:

(a) The eye muscles are composed of a special type of fiber not to be found elsewhere in the body (Woollard, 1930-1931), being of a fine and delicate structure richly supplied by nerves. It would be consistent with this refinement of make-up for these muscles to be associated with

properties of a less durable nature than the coarser type of fiber found elsewhere.

(b) The eye muscles are the only muscles in the body capable of responding to a nonspecific chemical stimulus while the nerve supply is intact. Other skeletal muscles will not contract when so stimulated unless the nerves have degenerated, as after section, or before they have grown into the muscles, as in the fetus. If, therefore, the eye muscles are more susceptible to chemical stimuli than any of the others, it would not be unreasonable to suppose that they would be more readily affected by a chemical toxin or toxemia, of which thyrotoxicosis is a first-class example. This view receives strong support from the fact that the type of degenerative change in the ocular muscles is out of all proportion to anything found elsewhere in the body.

(c) The abundant nerve supply is greatly affected by the morbid process taking place within the muscle bundles, often showing gross deterioration, and even disintegration, particularly in the finer terminal divisions. There can be no doubt that this disorganization of nerve supply is not without consequence upon the functioning of the muscles, and its extensive distribution within the eye muscles accounts partly for the greater disturbance of movement.

CLINICAL CONSIDERATIONS. Strong clinical confirmation of the influence of ocular-muscle weakness on the development of thyrotoxic exophthalmos has been presented by Plummer and Wilder (1935). These observers examined the problem by ascertaining the possibility of correlating the degree of weakness present as tested by a carefully graded series of exercises of the quadriceps and the degree of exophthalmos. The basis of the correlation was presumed to rest upon the assumption that the loss of strength in the quadriceps would be paralleled by a similar loss in the extraocular muscles which would predispose to forward dislocation of the globe. Some 2,000 cases were examined and the results of their observations enabled them to state that a positive correlation as outlined above existed. Thus in those cases in which no weakness of the quadriceps was detectable clinically, the percentage of exophthalmos present was 44; but in those in which weakness was evident, the frequency of the proptosis varied between 53 percent and 63 percent according to the degree of myasthenia present. The incidence of exophthalmos was therefore 10 percent to 20 percent higher in those cases with detectable myasthenia and in the main corresponded with the more severely toxic patients, the ratio of the proptosis falling concurrently with the rate of the metabolism.

B.M.R.	*Cases with Exophthalmos*	*Cases with no Exophthalmos*	*Ratio*
+70-+80	102	55	1.86 to 1
+50-+60	213	145	1.46 to 1
+30-+40	163	195	0.83 to 1
+20-+30	115	155	0.74 to 1

(Modified from Plummer and Wilder, 1935)

In certain instances of exophthalmic goiter, the loss of tone in the ocular muscles is so great that a sneeze or nod of the head may result in complete luxation of both globes in front of the lids and in their replacement, which is usually not difficult, the marked hypotonia and absence of increased intraorbital pressure may be clearly appreciated. On the other hand, the eye muscles may be so little affected that no exophthalmos develops.

EXPERIMENTAL CONSIDERATIONS. Additional information on the mechanism of thyrotoxic exophthalmos may be obtained from an examination of experimental evidence. It is known that feeding with

thyroid extract in animals does not lead to exophthalmos, and the finding may be explained on the basis that a state of hyperthyroidism is produced without an accompanying sympatheticotonia; but it is possible in these animals and also in man rendered artificially hyperthyroid by thyroid medication to induce a proptosis by the administration of a sympathomimetic drug. The experiments of Labbé and others (1931, 1933) have shown this. Labbé found that in dogs a dose of ephedrine equivalent to 0.5 mg. per kilogram of body weight was followed only by a questionable degree of proptosis, but that if thyroxine were given intravenously beforehand a marked exophthalmos, not dependent on increased retrobulbar pressure or edema, was produced. This exophthalmos, typically "basedowienne," could be made to recede regularly under the stimulating influence of yohimbine. Thus the coöperation of smooth-muscle spasm and extraocular-muscle weakness was effectively demonstrated; but the investigators carried their experiments a stage further by testing their views on the human being. The patient, an obese woman, had been taking daily a large dose of thyroxine (10 mg.). Marked signs of hyperthyroidism were present when the patient was given 50 mg. of ephedrine. Within five minutes, a prominent exophthalmos, more marked on the left side, had appeared and persisted for two hours. These observers also found that in other patients with exophthalmic goiter the administration of ephedrine accentuated the proptosis.

Equally instructive was the case described by Sainton and Hesse (1931) in which exophthalmos developed in a myxedematous patient as a result of treatment with adrenalin and thyroxine. The patient, with a long-standing case of myxedema, had been receiving a daily injection of 1 mg. of thyroxine. As a result of treatment the pulse rate accelerated and the basal metabolism rose from −30 percent to −6 percent but fell later to −14 percent in spite of continued dosage. Thereupon the amount of thyroxine given daily was doubled and supplemented by adrenalin. Eight weeks later, the pulse rate had risen to 100, about 18 pounds in weight had been lost, and the basal metabolism was +59 percent. Bilateral exophthalmos was present and "le symptome basedowien" was complete. On cessation of the adrenalin administration, but continuation of the thyroxine, the exophthalmos disappeared although the patient remained hyperthyroid.

In conclusion it may be stated that the anatomic, experimental, and clinical evidence accords well in favor of a mechanism based on sympathetic overaction and extraocular-muscle weakness, while there is very little that can be opposed to the view.

RELATION OF COCAINE TO EXOPHTHALMOS. Although not strictly relevant to the subject on hand, the rationale of the exophthalmos associated with the conjunctival instillation of cocaine merits a few words. The protrusion is accompanied by lid retraction and submaximal dilatation of the pupil, the light reflex remains and the dilating action of atropine is not opposed. These effects are not produced, as is sometimes stated, by local sympathetic stimulation, for cocaine has no effect on the sympathetic system anywhere else in the body and its action is not prevented by the previous administration of atropine. Cocaine, however, does possess the property of stimulating smooth muscle, and it seems that its effect on the pupil and lids is produced in this way by local permeation although this action in itself does not account for the proptosis nor explain why the ciliary muscle and the sphincter pupillae are relatively unaffected. Concerning the exophthalmos, however, it may be explained that the drug exerts constantly a depressant effect on striped muscle, even in the most dilute solutions, affecting excitability, contractility, and tone. This action is due to a direct effect on the muscle fiber or the receptor organ because it can arrest the action of drugs such as veratrine and quinidine which give rise to a contraction by acting on the myoneural junc-

tion. Absorption from the conjunctiva takes place through three channels, one of which comprises the lymph spaces around the extraocular muscles. Hence the tone of these striped muscles is reduced in consequence and a slight degree of exophthalmos may appear in response to the local stimulation of the anterior orbital smooth muscle. In connection with the subdued action of the drug on the ciliary and sphincter muscles, it may be assumed that its stimulating effect on the unstriped fibers of these muscles is countered to a certain extent by a depressant effect on the oculomotor end-plates, so that the purely sympathetic-supplied dilator is relatively freer to respond.

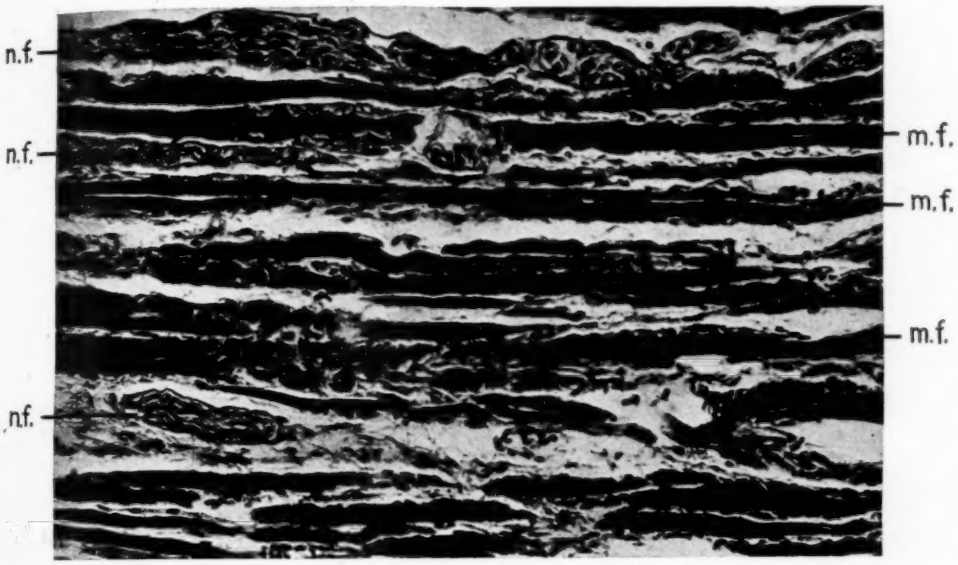

Fig. 4 (Mulvany). Eye muscle from severe case of thyrotoxicosis. Note general wasting of muscle fibers and irregularity in size, shape, and density (m.f.). Observe also abundant nerve supply, showing extensive and severe degeneration (n.f.).

II. Pathology of Eye-Muscle Change in Thyrotoxicosis

One of the earliest inquiries into the condition of the eye muscles in Graves's disease was made by Silcock (1886). His observations appertaining to a severe case showing advanced proptosis with almost complete immobility of the eyes were as follows: "There was nothing abnormal in the orbits except most noticeably a yellowish patchy discoloration of the recti and obliques which miscroscopical examination proved to be due to diffuse fatty infiltration, the muscles themselves though somewhat pale showing no trace of fatty degeneration." It was added that the muscles and nerves showed no histologic abnormality, and there was no mention of edema. This statement is only partially correct, for fatty degeneration can be made out in the muscle fibers which together with the nerves show many histologic alterations. Askanazy (1898) found extensive changes in many parts of the skeletal musculature, comprising loss of striation to absorption of entire muscle fibers. A striking feature was a widespread lipomatosis of the voluntary muscles. Later, Dudgeon and Urquhart (1926) examined the muscle in eight cases of Graves's disease and found changes which were attributed to chronic interstitial myositis. There was a proliferation of the interstitial cells and atrophy of the fibers in varying degrees. A small number of lymphorrhages were found, being small in size and most frequent in the eye muscles.

It is remarkable that in these contributions and in others that have since appeared on this subject, no mention has been made of the nerve degeneration which often equals in intensity the muscle changes.

Briefly, the pathologic changes may be summarized as follows:

Inspection reveals the muscles to be thin and sometimes pale, occasionally showing the patchy discoloration noted by Silcock. Microscopy shows a widespread and often extensive degeneration of the muscles and their at-

tendant nerves leading to the ultimate destruction of both (figs. 4-8). The muscle fibers show loss of striation, fibrillation, and granulation of the sarcoplasm followed by its absorption. This takes place either as a result of fragmentation, portions of fiber retaining a few nuclei breaking off, or by a more gradual process involving the whole length of a fiber, the density of which lessens until the fine supsupply (fig. 5). The neurilemma becomes granular and undergoes absorption so that in transverse section the fiber appears as an irregular ring with a nucleus placed rather eccentrically. Proliferation of the neurilemmal cells is also evident and often exceeds that of the muscle sheaths (fig. 6). These cells sometimes assume a pear-shaped form having a granular nucleus. Others resemble a lymphocyte but

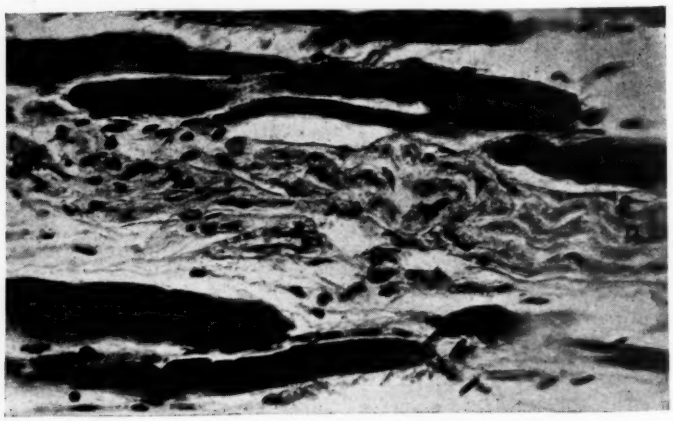

Fig. 5 (Mulvany). Eye muscle from thyrotoxicosis. Swelling of (n.f.) nerve fiber with granulation of neuroplasm. Slight proliferation of nuclei of neurilemmal sheath.

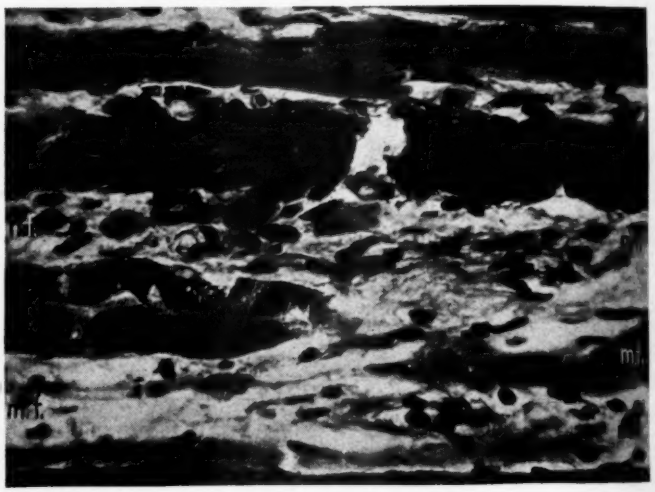

Fig. 6 (Mulvany). Thyrotoxic eye muscle. Degeneration of muscle (m.f.) and nerve (n.f.) fiber in close proximity. Note disorganization of both, the nerve fiber showing marked reduplication of neurilemmal cells, some of which have characteristic pear-shaped appearance with eccentric nucleus.

porting structure appears and is later absorbed. The nuclei often remain to the last. Proliferation of the sarcolemmal cells is a common feature although not generalized. In its earliest form it is seen as a pairing of the nuclei along the course of the fiber.

Equally constant are the changes in the nerves, which appear to suffer in the same degree as the muscles. The alterations are most marked in the smaller terminal branches, particularly alongside the muscle fibers which they contain rather more cytoplasm. Occasionally the terminal portion of the nerve fiber may degenerate into a husklike body containing practically no axon tissue (fig. 7).

The cellular distribution is diffuse but sparse (fig. 8). Many of the scattered cells appear to be derived from the nuclei of disintegrating nerve and muscle fibers, some of them undergoing transformation into fibroblasts. Small aggregations of lymphocytes occasionally occur but are few in number, and one may examine

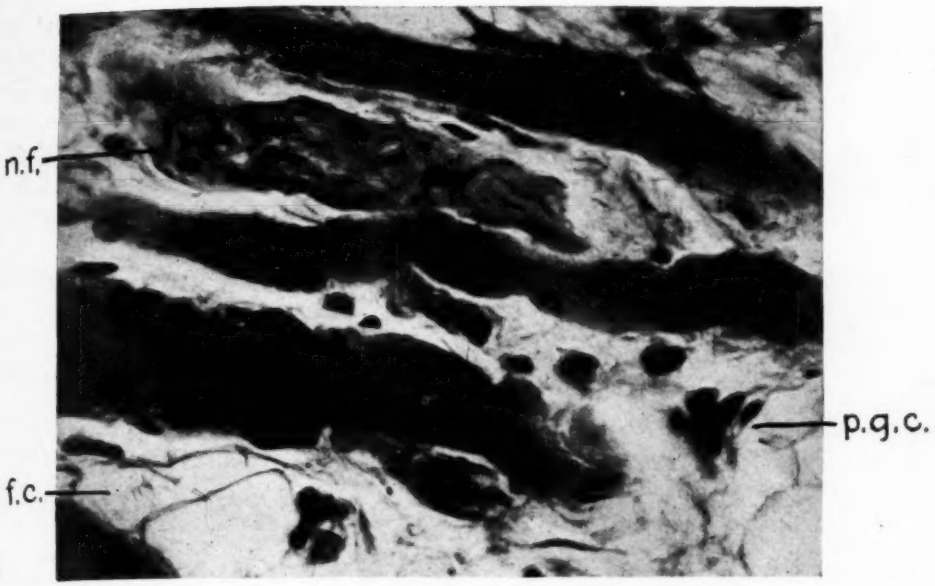

Fig. 7 (Mulvany). Thyrotoxic ophthalmoplegia. External-rectus muscle showing loss of striation, granulation of sarcoplasm, and reduplication of sarcolemmal nuclei. Note degenerated nerve husk (n.f.), pseudogiant cells due to portions of muscle fiber breaking off (p.g.c.), and few fat cells (f.c.). One muscle fiber is about twice the size of another.

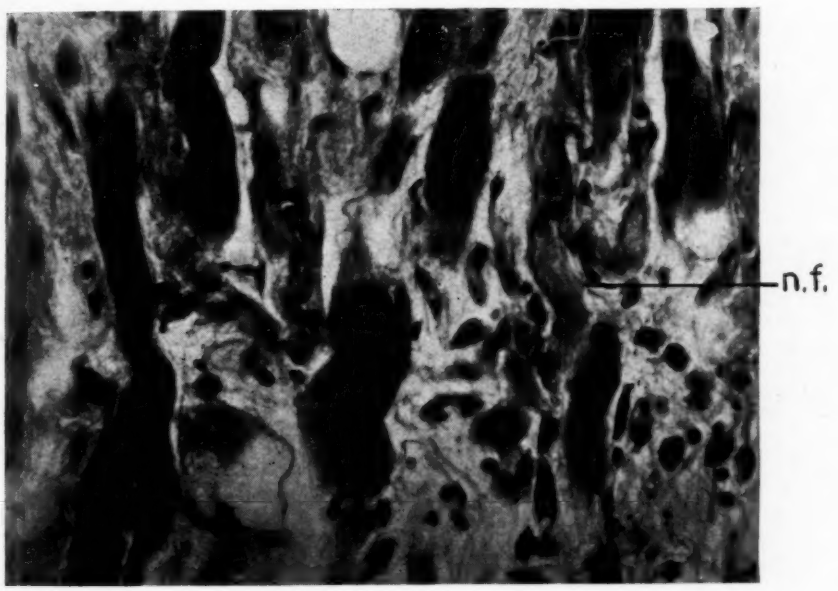

Fig. 8 (Mulvany). Thyrotoxic eye muscle. Note scattered yet sparse cellular distribution. Many cells are derived from degenerating nerve and muscle fibers. Note nerve husk (n.f.) and pear-shaped neurilemmal cells adjacent.

many fields without encountering them. Fat cells tend to increase in number, and many of the muscle fibers show varying degrees of fatty degeneration. In severely toxic cases, the interstitial fatty infiltration may attain the proportions of a lipomatosis which occasionally may equal in degree the diffuse infiltration accompanying motor atrophy of the tongue (fig. 9).

The other orbital structures escape disturbance. The optic nerve remains healthy and there is no change in the lacrimal gland. It may be emphasized that edema, diffuse or extensive round-celled infiltration, or marked fibrosis is absent.

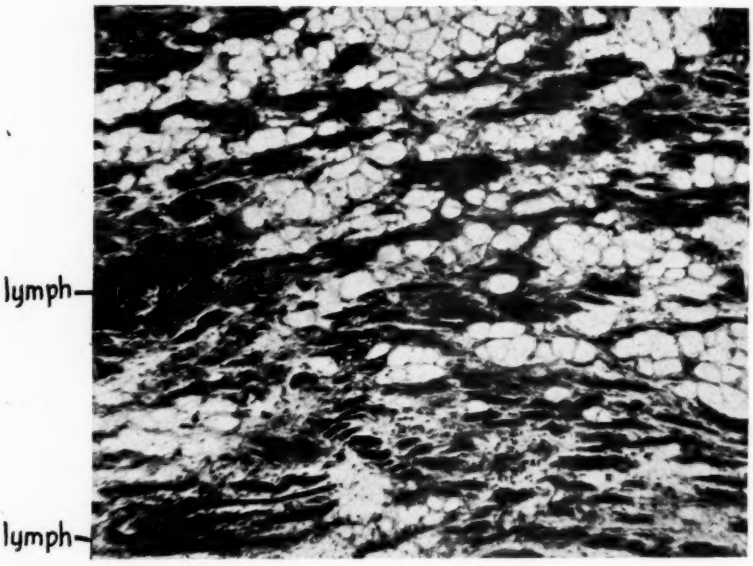

Fig. 9 (Mulvany). Thyrotoxic eye muscle showing marked fatty replacement of muscle fibers. Two lymphorrhages (lymph.) are present.

III. Symptomatology of thyrotoxic exophthalmos

The clinical features of this condition are so well known that observations will be confined to three items; namely, a classification of the eye phenomena grouped accordingly to mode of origin, the oculomotor palsies and their mechanism, and corneal ulceration. A few remarks on an early clinical sign will also be included.

1. Classification of ocular phenomena. It has been observed that the appearance of exophthalmos depends on the simultaneous occurrence of weakness of the voluntary extraocular muscles and spasm of the anterior orbital smooth muscle, and it is not surprising to find that many of the associated features are based on these two factors. Others depend on complex disturbances of local muscle control, on local vascular alterations, and on exposure; while not a few, such as edema of the eyelids and ophthalmic neuralgia (both apart from corneal ulceration) and optic neuritis, are more properly features of the thyrotrophic variety of proptosis than of thyrotoxicosis and therefore have not been included in the underlying table.

a. *Signs due to disturbance of orbital-muscle balance.*

(1) Signs Due to Reduction of Voluntary Eye-muscle Tone

Ballet (1888): Weakness of external rectus muscle.

Basedow (1840): Lagophthalmos, inability to close eyes.

Joffroy (1893): Loss of wrinkling of forehead due to frontalis weakness.

Kast/Wilbrand (1891): Visual restriction due

to weakness of extraocular muscles.
Moebius (1886): Difficulty in convergence.
Suker (1917): Difficulty in following horizontal movement.

(2) Signs Due to Overaction of Orbital Smooth Musculature

Claiborne/Rogers (1920): Mydriasis in advanced cases.
Cohen (1912): Hitch in lid movement.
Cooper/Dalrymple (1849): Spasm of "levator palpebrae" causing upper-lid retraction and exposing sclera above iris.
Curschmann (1922), Loewi (1921): Mydriasis following adrenalin administration.
Gifford (1906): Difficulty in eversion of upper lid.
von Graefe (1857): Exposure of sclera on downward movement of eye.
Knies (1895): Dilated and unequal pupils.
Kocher (1911): (a) Spasmodic retraction of upper lid on fixing an object. (b) On elevation, sclera is uncovered by lid moving first.
Koller (1903), Stellwag (1869): Retraction of both lids exposing sclera above and below cornea.
Pochin (1939b): Reduced amplitude of blinking.
Stellwag (1869): Infrequency of blinking.

(3) Signs Due to Obscure Disturbance of Local Muscle Control

Curschmann (1917): Reversed Argyll Robertson pupil.
Freund (1891), Knies (1895): Tremor of eyeballs, nystagmus. Hitschmann (1894), Plummer/Rynearson (1932): Increased frequency of blinking.
Liebrecht (1890), Hömen (1892), Rosenbach* (1919): Tremor in upper lid when closed.
Wilder (1920): Jerking of eyes on changing from full abduction to adduction.

b. *Signs due to local vascular alterations*

Becker (1873): Abnormal pulsation of retinal arteries.
Drummond (1887), Mackenzie (1890), Jellinek* (1904): Pigmentation of lids.
Oppenheim (1887): Pigmentation of conjunctiva.
Snellen/Donders (1871), Riesman* (1916): Bruit over eyeball.

c. *Signs due to exophthalmos*

Basedow (1840): Lacrimation; conjunctivitis; chemosis, especially in exposed portions of conjunctiva; keratitis; perforation leading to panophthalmitis.
Berger (1902): Epiphora.
Knies (1895): Corneal insensibility.
Pain/Trousseau (1868), Burrows (1925): Dislocation of both globes.
Posey/Spiller (1906): Obliteration of superior orbito-palpebral sulcus.
Sattler (1909), Vigouroux (1887): Puffiness of lids not due to edema.
Topolanski (1936): Congestion of anterior region of eye.

Many of these signs refer to one feature or a variant of it and the majority are present only in association with an obvious exophthalmos. With the exception of upper-lid retraction, very few of them are early or helpful in estimating the presence of an incipient proptosis; and the value of upper-lid retraction is not great, as its occurrence is not confined to thyrotoxicosis, being not uncommon in normal individuals, particularly when of nervous temperament, in the anxiety states, in certain lesions of the C.N.S., and in local affections of the orbit. It would be helpful, therefore, if a more accurate method of assessing an early proptosis in thyrotoxicosis were available, and it seems that this is feasible. Most observers at one time or another will have received the impression of a slight degree of exophthalmos in a particular patient in the absence of definite criteria to that effect. In some instances, retraction of the upper lid or a staring expression has created the effect; but in others it probably has been the exposure of a small rim of sclera between the iris and the lower lid. Exposure of the sclera in this position was noted early by Basedow and Stellwag; but the cases in question were advanced, and it is not generally known that careful examination will show the presence of this feature very early in the course of the disease, as soon, if not sooner, than the Dalrymple sign.

In about 90 percent of normal people it is a fact that when the head is held naturally erect and the eyes are directed horizontally forward the lower lid just meets

* The signs to which the names of Rosenbach, Jellinek, and Riesman are commonly attached were described so much earlier by other observers that the retention of these names for descriptive purposes is hardly warranted.

the lower margin of the iris, no sclera being visible between them. In thyrotoxicosis, this relationship is disturbed almost at once, owing to the combined effect of proptosis and lower-lid retraction (fig. 10). Exophthalmos by itself will produce this phenomenon very early, as was pointed out by Pochin (1938), but in exophthalmic goiter it is probable that its appearance is facilitated by a slight degree of lower-lid retraction which, however, is never marked owing to early raising of the level of the palpebral fissure by retraction of the upper lid. The importance of this sign lies in the fact that it is clinically demonstrable before the exophthalmos is measurable and that it is present in about 75 percent of early cases; indeed, in the younger type of patient with the diffusely hyperplastic gland, it is almost universally perceptible and can be of particular aid to diagnosis in deciding between an anxiety state and early thyrotoxicosis when estimation of the basal metabolism may not be available and other features are equivocal. As mentioned above, however, the sign may be obscured at an early stage by the raising of the level of the palpebral fissure, which causes the lower lid once more to approximate to the margin of the iris (fig. 11). As the proptosis progresses, the white line reappears.

Figs. 10 and 11 (Mulvany). Early case of thyrotoxicosis. Fig. 10, showing appearance of lower scleral rim. Fig. 11, showing masking of lower scleral-rim phenomenon by raising of the level of the palpebral fissure occasioned by retraction of upper lid.

In examining for the test, it is important to bear in mind two points: (1) The test is delicate and it is essential that the head be held correctly. In general, this will be obtained by ensuring that a line drawn from the roof of the auditory meatus to the lower orbital margin is horizontal, but in practice visual appraisement will suffice. A slight degree of forward tilt of the head or upward movement of the eyes will create a false white line while the reverse movements will tend to mask its presence in thyrotoxicosis. How necessary the correct stance is may be gauged from the frequency with which von Graefe's sign is illustrated with the head in a position of backward tilt and the eyes directed downward. Under these conditions, normal people may show von Graefe's sign. (2) A small percentage of persons, between 8 percent and 10 percent, normally show a lower scleral rim when the conditions of the test are properly observed. In certain instances this is familial; in others it may be due to orbital shallowness, to a slight increase of orbital fat, or to some peculiarity in the conformation of the lower lid; while in a number of middle-aged men a very slight degree of unilateral and less commonly bilateral proptosis will tend to appear spontaneously. In a doubtful case, therefore, its significance should be assessed in relation to the position of the upper lid, which normally lies somewhere near the midpoint between the pupil and the top of the iris. In thyrotoxicosis, when exophthalmos is present, the upper lid is retracted;

hence the combination of lower scleral rim and upper-lid retraction is highly significant.

2. THYROTOXIC OCULOMOTOR PALSIES. An indication of the process responsible for the appearance of the ocular palsies will have been gauged from the preliminary remarks on the mechanism of the exophthalmos in relation to thyrotoxic myasthenia and hypotonia. From the slight or moderate degree of weakness of the voluntary eye muscles which is a constant accompaniment of thyrotoxic exophthalmos to a palsy in one or other of them is a step of no great difficulty to follow, depending, no doubt, on an irregular distribution of the muscle weakness.

The thyrotoxic ophthalmoplegias bear many features in common with the eye palsies of myasthenia gravis, the points of greatest resemblance being the distribution—which may be limited to one or two muscles or more widespread, being associated with palsies of the other motor cranial nerves—and the tendency to improvement after rest or following an injection of prostigmine. Points of contrast are found in the early progression of an affected eye muscle to complete paralysis and the less characteristic response to prostigmine, a distinction probably connected with the associated neuromuscular degeneration. Nevertheless, brilliant exceptions occur. Fraser (1937) records a good response to prostigmine in a patient with bilateral ophthalmoplegia involving several muscles of about 12 years' standing, and Zondek (1938) describes a case of complete immobility of the eyeballs and generalized weakness in which most of the eye movements were restored after a single injection of 0.5 mg. of the drug (fig. 12). Improvement of this type, however, is rare and together with the myasthenic reaction is more likely to be found in the severe and rapidly progressing case.

As a rule, the thyrotoxic ophthalmoplegia is ushered in by ptosis or a diplopia, the latter being of a more stable character than that accompanying myasthenia gravis. The process may be limited to one muscle, in which case the levator palpebrae or, as noted respectively, by Moebius and Ballet, the internal and external recti.

Fig. 12 (Mulvany). Thyrotoxic ophthalmoplegia. Complete loss of ocular movement restored by prostigmine. Generalized myasthenia was also present (Zondek, 1938).

In the case of multiple lesions, bilateral ptosis with loss of lateral or vertical rotation is common, but numerous combinations are achieved although seldom without weakness in most of the other eye muscles. Total ophthalmoplegia may occur without a preliminary strabismus but is often associated with a disturbance of the cranial motor nerves and some degree of generalized myasthenia. Its course tends to be rapid, so that thyroidectomy should not be delayed.

In assessing the relative frequency of the various ocular palsies, not a great deal of help is derived from the literature, owing to the inclusion of instances of loss of eye movement accompanying the thyrotrophic type of exophthalmos. In this variety, the restriction of ocular movement is partly mechanical and occurs quite independently of any associated hyperthyroidism. It is almost exclusively in the direction of elevation in the initial

phase. Hence the impression has been gathered that paralysis of the superior-rectus muscle is the most frequent lesion in a thyrotoxic ophthalmoplegia when it is actually one of the less common. Loss of eye movement in thyrotrophic exophthalmos, however, not infrequently proceeds to total immobility, but the myasthenic reaction is never present nor is there the slightest response to prostigmine, which, indeed, is quite precluded by the

Fig. 13 (Mulvany). End result of infected corneal ulceration following spontaneaus subsidence of disease without thyroidectomy (Jessop, 1896).

nature of the pathologic process in the eye muscles. At this stage the differential diagnosis is straightforward, and it is of practical importance to the patient that this circumstance be recognized, for the success of Naffziger's orbital decompression in thyrotrophic exophthalmos has led to the operation's being performed needlessly in thyrotoxic ophthalmoplegia. The writer is aware that this procedure was carried out in 1938 on two patients suffering from advanced proptosis due to thyrotoxicosis—with a fatal issue in both, one succumbing from thyroid crisis and the other from auricular fibrillation. At operation, nothing was found in the orbits to account for the exophthalmos and autopsy in one patient confirmed the operation findings.

3. CORNEAL ULCERATION. A few remarks concerning this complication may be of interest on account of the difference of opinion regarding the advisability of lid suture as part of the local treatment. The controversy is old and as long ago as 1896 formed the subject of discussion at a meeting of the Ophthalmological Society when no definite conclusions were attained. The origin of the disagreement appears to have been derived from a failure to distinguish between the ulceration occurring in Graves's disease and that of thyrotrophic exophthalmos. The causative factors leading to ulceration in these two varieties are different and require special methods of treatment. Corneal ulceration in thyrotoxicosis has never been common and today is still less frequent, owing to early diagnosis and treatment. When present it is generally of a superficial character which may persist with intervals of healing for many years in the absence of treatment to the thyroid gland. Little inconvenience may be caused in these cases unless secondary infection supervenes, when the condition may proceed to a panophthalmitis as it did in one of Basedow's cases. Spontaneous healing, however, without thyroidectomy is possible even in the most severe type (fig. 13). Usually the ulceration develops slowly but in certain severely toxic instances may appear rapidly and go on to perforation comparatively early.

The course and treatment of this complication differs little from that of ulceration due to more common causes. Thyroidectomy constitutes the first essential but may be combined with lid suture if the circumstances warrant it. This latter measure may be employed for all degrees of thyrotoxic ulceration when nonin-

fected, for the tension between the lids and the globe is not severe and palpebral spasm can be relieved by section of the tissue containing the unstriped muscle at its point of attachment to the tarsal plates. The onset of infection and chemosis renders the problem more serious, owing to increasing surface tension. Relief of the pressure becomes necessary and may be accomplished by free tarsorrhaphy, by excision of portions of the chemosed conjunctiva, and by a paracentesis if complicated by hypopyon and a rising intraocular pressure. Approximation of the lids should be effected on a broad contact, aided if necessary by intermarginal splitting, as suggested by Priestley Smith (1913), but a small gap should be left at each canthus for drainage. In this way relief from pressure and exposure together with rest may be successful. Less thorough methods may be unsuccessful even when supplemented by thyroidectomy, and instances of failure have been recorded, one or both eyes having been lost before the beneficial effect of the thyroid operation could be appreciated. It is of interest to recall in this connection that after enucleation of the globe the orbital muscles were found to be atrophied and no excess of exuberant tissue was seen, a finding previously emphasized as being the constant accompaniment of thyrotoxicosis.

In thyrotrophic exophthalmos, the problem is gravely altered by the fact that the proptosis is produced by an irresistible increase of the intraorbital pressure which is countered by an equally forceful opposition from the edematous lids. The tension between the lids and the surface of the cornea may be enormous and quickly leads to chemosis and perforation. It follows therefore that lid suture here, however cleverly aided by tarsorrhaphy, will serve only to aggravate the vicious character of the morbid process. Hence disaster is the common sequel to treatment of this type of ulceration by lid suture, and it should be recognized that the sole means of saving the eye at this stage, as advocated by Naffziger, lies in orbital decompression.

4. Treatment of thyrotoxic exophthalmos. Apart from local measures directed to effects resulting from exposure, treatment obviously will be directed to relief of the general condition, although regression of the proptosis following may be slight or even absent. The reason for this anomaly is fourfold: first, the stretching of the degenerated voluntary muscles has led to permanent lengthening of their fibers; second, retraction of the tissues lying between the lids and the region of the equator of the eye has occurred and tends to persist; third, the extensive morbid process involving the neuromuscular mechanism impedes the early return of normal tone and consequent ability of the muscle to retract; and lastly, with the fall in the basal metabolism, the retrobulbar space fills up with a more solid type of fat. The best chance of improving the exophthalmos after operation consists in aiding the retraction of the extraocular muscles during the early period of restoration of tone. This may be obtained by pressure on the globes sustained during sleep and for as many hours during the day as possible. After a few weeks the measure may be discontinued as the maximum improvement will then have taken place.

In cases of severe and persistent exophthalmos, the effect can be minimized by a narrowing of the palpebral fissure. This can be achieved by a tarsorrhaphy uniting the lids in the outer fourth or fifth of their extent. The maneuver has the merit of simplicity and is capable of re-

versibility should this be desirable. An alternate measure, particularly when lid retraction is marked, consists of a plastic operation of the type devised by Goldstein (1934), which has the effect of veiling the proptosis without producing a ptosis. A similar result has been obtained by a cervical sympathectomy, but the outcome of the operation is uncertain and disappointing. It is advisable, therefore, first to assess its possible value by examining the effects of local anesthesia of the lower cervical ganglion. Undoubtedly, the first measure is the one of choice. Concerning the treatment of the ocular palsies, when improvement has failed to follow a thyroidectomy, this should consist of the usual methods of advancement and recession of the affected tendons after an appropriate interval to allow of recovery of muscle tone has passed.

(Part II will appear in the next issue.)

SUGAR CONTENT OF CATARACTOUS HUMAN LENSES*

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Investigators have been interested in the sugar content of the crystalline lens for a long time—that is, since 1854, according to Lottrup-Andersen[1]—but their investigations were of only qualitative nature up to 1927, when Lottrup-Andersen for the first time made quantitative determinations. This author discusses some 33 references, only half of which reported sugar in the crystalline lens; all others failed to detect any sugar whatsoever. Lottrup-Andersen, using the modern Bang-Hagedorn micro-method, not only proved with certainty the presence of sugar in both normal and cataractous human lenses, but also showed wide variations in the sugar content between individual lenses of the same type as well as between groups of different kinds of lenses—that is, cataracts of the more common type, diabetic cataracts, and normal lenses. Their average sugar values were 46.3, 82.0, and 60.0 mg. percent, respectively. The analyses, however, were carried out on a rather small number of lenses—that is, 22, 3, and 5 lenses, respectively—and no attempt was made to make comparisons between incipient, intumescent, and mature cataracts, on the one hand, and the different stages of sclerosis on the other as well as to compare the results on the basis of age. The average age of patients from whom normal lenses were obtained was considerably lower than that of the cataract patients, and this difference in age may have had something to do with the stated difference between the respective sugar values.

The present study was undertaken to supplement Lottrup-Andersen's work along the suggested lines.

The sugar was determined by a modification of Gibson's[2] colorimetric method for finger-tip blood sugar. Since by this modified procedure very small quantities of sugar can be accurately and rapidly estimated in any kind of solid animal tissue that gives clear supernatant fluid after the precipitation of the protein, it is given here in detail.

All the reagents were prepared as described in Gibson's method. After the lens was weighed on a small piece of filter paper, it was transferred, together with the filter paper, to a thick-walled 15-c.c. centrifuge tube. To this were added 3 c.c.

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of a freshly prepared mixture of the 1.25-percent sodium tungstate solution and the two-thirds N sulfuric acid in the proportion of 7 to 1, this proportion being more effective in precipitating the lens protein than Gibson's 5 to 1. The lens was removed from the filter paper into the tip of the tube by means of a blunt glass stirring rod and macerated and dispersed as finely as possible. Then the filter paper was treated in the same way and intermixed with the lens particles. The tube was stoppered and centrifuged at the rate of 3,500 r.p.m. for approximately 10 minutes. The supernatant fluid was decanted into a 15-c.c. centrifuge tube, and 2 c.c. were used (in a Folin-Wu sugar tube) for analysis. In another tube 2 c.c. of the 0.004-percent sugar solution were used as standard. To each tube were added 2 c.c. of the alkaline copper tartrate reagent, and the contents were well mixed. The tubes were heated for six minutes in boiling water. After cooling under tap, 2 c.c. of the arseno-phosphotungstic acid reagent were added to each tube, and the contents were well mixed. Both sample and standard were diluted to 10 c.c. and mixed by inverting the tubes several times, after which their colors were compared in the colorimeter. For calculation the following formulas were used:

$$\frac{15 \times 0.08 \times 100}{S \times W \times 0.667} = \text{mg. percent sugar,}$$

or

$$\frac{15 \times 0.08}{S \times 0.667} = \text{mg. sugar per lens.}$$

In these formulas, 15 = the color reading of the standard, 0.08 = mg. sugar in 2 c.c. of standard, S = the color reading of the sample, W = weight of sample in grams, and 0.667 = two thirds of sample.

In all, 191 senile cataractous lenses, extracted by the intracapsular method, were analyzed. The results are arranged according to stage of cataract (table 1), stage of sclerosis (table 2), and age of the patient (table 3).

TABLE 1

MINIMUM, MAXIMUM, AND AVERAGE SUGAR VALUES OF CATARACTOUS LENSES ACCORDING TO STAGE OF DEVELOPMENT

Stage of Cataract	No. of Lenses	Age of Patient	Duration years	Weight gm.	Mg. per Lens	Mg. % in Lens	Mg. % in Blood
Incipient	118	40–87	0.5–20.0	0.1180–0.3055	0.022–0.176	10.4–58.0	44–297
Average		70.7	2.3	0.2061	0.085 (0.084)*	40.1 (39.5)*	131 (130)*
Intumescent	32	43–84	0.5–10.0	0.1256–0.2775	0.034–0.310	23.4–95.2	51–200
Average		70.1	2.8	0.2089	0.096 (0.076)*	47.1 (42.2)*	138 (121)*
Mature	41	51–86	0.7–12.0	0.1236–0.2300	0.033–0.191	18.4–84.3	72–221
Average		72.2	2.9	0.1807	0.073 (0.065)*	37.1 (35.1)*	130 (127)*

* Diabetics excluded: Incip. 1 diab., 0.85 percent; Intum. 4 diab., 12.5 percent; Mat. 1 diab., 2.4 percent.

The average duration of failing vision varies from 2.3 years for incipient cataracts to 2.8 years for intumescent and 3.9 years for mature cataracts.

The average weight of the lens increases from 0.2061 gm. in incipient cataracts to 0.2089 gm. in intumescent cataracts, then decreases to 0.1807 gm. in mature cataracts.

The 191 cataracts included six lenses from diabetics, one of which was incipient, four intumescent, and one mature. In terms of percentage they constitute 0.85, 12.5, and 2.4 percent of the total numbers (118, 32, 41) of the three groups of lenses, respectively. The sugar values in parentheses (see tables), marked with an

asterisk, represent averages exclusive of diabetics.

The absolute sugar values, or milligrams per lens, including diabetics, are 0.085, 0.096, 0.073 mg. for incipient, intumescent, and mature cataracts, respectively; with diabetics excluded, they are 0.084, 0.076, and 0.065 mg. In terms of milligrams percent, they are 40.1, 47.1, 37.1, and 39.5, 42.2, and 35.1, respectively. Thus in terms of milligrams percent there is a considerable increase in the sugar content in intumescent and some decrease in mature cataracts as compared with incipient cataracts. The question arises: Is intumescence the cause of the increase in the sugar content, or is the latter a contributing factor to intumescence? It may be reasoned that, since intumescent cataracts contain much more water than other cataracts, they must have greater solvent capacities for sugar. There is about twice as much sugar in the surrounding aqueous and vitreous humors as in the normal lens, and the tendency of the sugar molecules is to move from a solution of a higher to one of a lower concentration. This should be the case provided the extra solvent is already present in the lens. However, both the water and the sugar must come from outside, and can enter the lens only simultaneously. On the other hand, the fact that 12.5 percent of the intumescent cataracts come from diabetics (as against 0.85 and 2.4 percent for incipient and mature cataracts) shows a rather intimate connection between intumescence and diabetes, and it is reasonable to assume that diabetes may have something to do with the causation of intumescence and not vice versa. This assumption is strongly supported by the fact that the average sugar value (42.2 mg. percent) of intumescent cataract, exclusive of diabetics, is also significantly higher than that of incipient cataracts (39.5 mg. percent) exclusive of diabetics. A part of the sugar in the tissue is supposedly in combination with the protein[3, 4, 5, 6] and not in solution. On the disintegration of the tissue, as in autolysis, the sugar may be released in a soluble form and thus act as the attracting medium for water. The intumescent cataracts therefore are, on the whole, more or less intimately connected with disturbances in sugar metabolism.

TABLE 2

MINIMUM, MAXIMUM, AND AVERAGE SUGAR VALUES OF SCLEROSED LENSES ACCORDING TO STAGE OF DEVELOPMENT

Stage of Sclerosis	No. of Lenses	Age of Patient	Duration years	Weight gm.	Mg. per Lens	Mg. % in Lens	Mg. % in Blood
0 and +	14	43–78	0.5–4.0	0.1700–0.2424	0.037–0.176	20.9–113.4	87–192
Average		66.0	1.8	0.2074	0.083	40.5	134
++	27	51–85	0.5–20.0	0.1538–0.3055	0.046–0.158	27.8–63.8	78–297
Average		68.2	2.6	0.2068	0.091	43.0	130
+++	51	48–85	0.5–12.0	0.1586–0.2848	0.050–0.153	10.4–56.0	51–253
Average		71.3	2.1	0.2127	0.089 (0.084)*	41.5 (39.2)*	128 (125)*
++++	99	40–87	0.5–10.0	0.1180–0.2775	0.022–0.191	11.2–95.2	44–221
Average		72.1	2.9	0.1825	0.069 (0.061)*	41.2 (38.5)*	134 (129)

* Diabetics excluded: +++ 2 diab., 3.9 percent; ++++ 4 diab. 4.0 percent.

The average blood-sugar values are nearly the same for patients with incipient, intumescent, and mature cataracts—that is, 131, 138, and 130 mg. percent, inclusive of diabetics, and 130, 121, and

127 mg. percent, exclusive of diabetics, respectively.

When the lenses, inclusive of diabetics, are arranged according to stage of sclerosis (table 2), no significant variations occur in the sugar content; the average values vary somewhat irregularly between 41.2 and 43.0 mg. percent. Exclusive of diabetics, a tendency toward lower sugar values during the last two stages of sclerosis (+++, ++++) is, however, indicated, the average values for these last two groups being 39.2 and 38.5 mg. percent as compared with 40.5 and 43.0 mg. percent for the first two groups, respectively. There are no significant variations in the sugar content of the blood inclusive or exclusive of diabetics, which fact should be attributed to the relatively small number of diabetics.

In table 3 the results are arranged according to age. The average duration of failing vision varies rather irregularly from 2.1 to 3.6 years. The average weight of the lens increases uniformly from 0.1802 gm. in the 4th and 5th decades* to 0.1994 gm. in the 6th decade, to 0.2042 gm. in the 7th decade, and to 0.2045 in the 8th decade. The absolute sugar values per lens are nearly the same for the 4th and 5th, the 6th, and the 7th decades, varying from 0.080 to 0.088 mg. per lens, but in the 8th decade the value drops to 0.073 mg. No significant variations occur in the average values exclusive of diabetics. On the basis of percentage, the values, inclusive of diabetics, decrease from 45.9 mg. percent in the 4th and 5th decades to 39.7 mg. percent in the 6th decade, to 42.9 percent in the 7th decade, and to 36.2 mg. percent in the 8th decade. Exclusive of diabetics, they decrease from 40.0 mg. percent to 39.7, 39.7, and 36.2 mg. percent, respectively. On the other hand, blood-sugar values, exclusive of diabetics, show an opposite tendency, increasing from 113 mg. percent in the 4th and 5th decades to 127 mg. percent in the 6th decade, to 131 mg. percent in the 7th decade, and to 145 mg. percent in the 8th decade. The same general tendency prevails with the values exclusive of diabetics; that is, an increase from 112 mg. percent to 127, 126, and 145 mg. percent, respectively.

The absolute sugar values of the six cataracts from diabetics vary from 0.128 to 0.310 mg. per lens, with an average of 0.226 mg. The relative values vary from 58.0 to 136.4 mg. percent, with an average of 103.1 mg. percent. These values are approximately the same as those for nor-

TABLE 3

MINIMUM, MAXIMUM, AND AVERAGE SUGAR VALUES OF CATARACTOUS LENSES ACCORDING TO AGE

Decade	No. of Lenses	Age of Patient	Duration years	Weight gm.	Mg. per Lens	Mg. % in Lens	Mg. % in Blood
4th and 5th	18	52.5	1.0– 7.0	0.1380–0.2481	0.043–0.131	27.0–61.1	74–150
Average			3.3	0.1802	0.080 (0.074)*	45.9 (40.0)*	113 (112)*
6th	46	65.2	0.5–12.0	0.1445–0.2762	0.022–0.240	10.4–104.0	78–253
Average			2.1	0.1994	0.081	39.7	127
7th	107	74.2	0.5–20.0	0.1180–0.2848	0.037–0.191	18.4–84.3	44–297
Average			2.6	0.2042	0.088 (0.082)*	42.9 (39.7)*	131 (126)*
8th	20	83.0	1.0–10.0	0.1631–0.3055	0.044–0.141	23.4–50.0	84–217
Average			3.6	0.2045	0.073	36.2	145

* Diabetics excluded: 4th and 5th 2 diab., 11.1 percent; 7th 4 diab., 3.8 percent.

* Fourth and fifth decades were combined on account of the small number of lenses.

mal blood. The blood-sugar values of the diabetics vary from 96 to 281 mg. percent, with an average of 217 mg. percent.

Summary

In all, 191 senile cataractous lenses, extracted by the intracapsular method, were analyzed for their sugar content. Significantly, only 0.85 percent of the incipient, 2.4 percent of the mature, but 12.5 percent of the intumescent cataracts came from diabetics. Inclusive of diabetics, the average sugar value increases from 40.1 mg. percent in incipient cataracts to 47.1 mg. percent in intumescent cataracts, then decreases to 37.1 mg. percent in mature cataracts. Exclusive of diabetics, the value increases from 39.5 mg. percent to 42.2 mg. percent, then decreases to 35.1 mg. percent respectively. The average sugar value of the six cataracts from diabetics is 103.1 mg. percent. The intumescent cataract is therefore intimately associated with general disturbances in sugar metabolism.

The average sugar value of the crystalline lens, exclusive of diabetics, decreases rather uniformly with age from 40.0 mg. percent in the 4th and 5th decades to 36.2 mg. percent in the 8th decade. On the other hand, that of the blood increases from 112 mg. percent to 145 mg. percent, respectively.

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PNEUMO-ENCEPHALOCELE, SECONDARY TO A PUNCTURE WOUND OF THE LID*

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A case of pneumo-encephalocele is presented in which a brain abscess containing gas was suspected, secondary to a puncture wound of the upper lid.

C. M. A., a white girl, aged three years, entered Children's Hospital on April 6, 1943, with the following history and findings:

On the evening of March 23, 1943, the patient fell while carrying a pencil. She cried a good deal, but the mother noticed no injury to the child. The next morning the right eye was swollen shut. The patient was seen by a local doctor, who gave some local therapy. In two to three days the entire right side of her face was swollen. The patient was given a sulfa drug (dosage unknown) for five days, as the result of which the condition improved; she played and ate well, and the swelling subsided. On April 3, 1943 (10 days after the injury) the eye again became swollen, the patient became drowsy. The sulfa drug was again administered, but the child remained drowsy for the next three days, taking very little food or water from April 3, 1943, until her admission to Children's Hospital on April 6, 1943.

Physical examination. The child's temperature was 101.5°F.; her pulse rate 120; respiration 24. The white-blood-cell count was 11,750; red blood cells, 3,030,000; urinalysis negative.

The patient appeared toxic and was drowsy. Her skin was dry. There was no adenopathy. The general physical examination was essentially negative but for a mild rhinitis on the right and the following findings in the right eye.

Ocular examination. The eye was swollen shut with a red, prominent, warm, upper lid. A small scar was seen in the upper lid just lateral to the middle of the lid. Very little reaction was present in the lower lid. The eye could be opened with effort. The conjunctiva was negative, except for edema above. The globe moved freely, but was displaced down and out. There was minimal proptosis. The pupil reacted to light. The patient was unable to elevate the globe.

A diagnosis of orbital cellulitis was made, and the patient was put on a therapy of sulfadiazine in adequate doses, tetanus antitoxin 1,500 units (none given previously), nose drops, and heat to the right eye.

Course. The patient was given special consideration upon examination for signs and symptoms of tetanus and cavernous-sinus thrombosis. She received a full course of tetanus toxoid initialed April 7, 1943. Cultures from the nose made on that date showed Staphylococcus aureus. The blood culture was negative on two occasions. The child continued to run a septic temperature (elevated to 103° to 104° in the afternoon) for the next few days. On April 9, 1943, the reaction in the lid seemed to become localized and with the patient under general anesthesia the area was aspirated. About 3 c.c. of a heavy yellowish-gray pus was obtained. On culture this aspirated material grew Staphylococcus aureus; but there was no attempt to make an anaerobic culture. The upper lid was then incised at the fold. An ophthalmoscopic examination

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under general anesthesia revealed only hyperemia of the disc of the right eye.

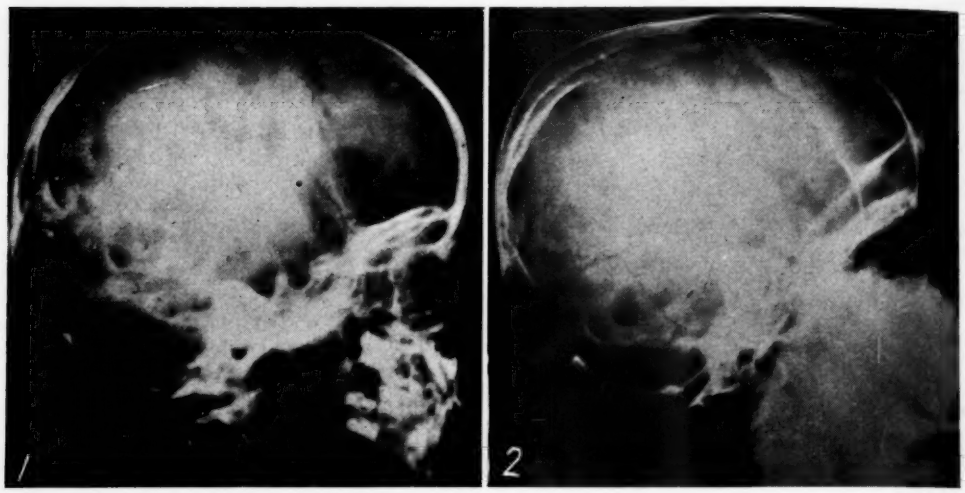
The patient received fluids subcutaneously and intravenously, and was given a blood transfusion on April 12, 1943, because of a low hemoglobin percentage. Also on this day a second pointing area was incised below the previous drainage site; no anesthesia was used. There was found to be an unusually large collection of pus under the orbital rim. When a hemostat was used to rupture and drain this area through the original drainage site, pus under pressure was obtained followed by gas. It was noted that the usual smell of Clostridium welchii was not present. X-ray films of the right orbit were then taken. A cavity partially filled with gas (fig. 1) was discovered and a diagnosis of brain abscess containing gas in the right frontal lobe just overlying the orbital plate was made. The eye improved, drainage decreased and finally stopped. On April 18, 1943, the fundus of the right eye was described as follows: Margins of the disc are indistinct, with some edema of the disc; the blood vessels are dilated, tortuous, and pushed centrally at the disc.

Left eye: Margins of the disc are fuzzy; the veins show minimal dilation; neither hemorrhages nor exudates are seen in either eye.

The patient was unable to look up and had pain in the right eye if she made the attempt.

Thereafter improvement was marked. The administration of the sulfa drug was stopped, and the temperature was normal on April 18, 1943. The fundoscopic examination was repeated on April 25, 1943. It showed only indistinct disc margins in the right eye. The eye continued to be displaced down and out, with the action of the superior rectus absent.

X-ray films of the head were checked twice weekly and the amount of the gas in the cavity and the size of the cavity were seen to decrease gradually. On May 13, 1943, no air was observable (fig. 2). The fundi were negative. The blood count gradually returned to normal. The function of the superior rectus returned.



Figs. 1 and 2 (Slaughter and Alvis). X-ray studies in a case of pneumo-encephalocele. Fig. 1, Position: head resting on the left side (April 12, 1943). Fig. 2, Position: head resting on left side (May 13, 1943).

The neurosurgical service was not convinced that the lesion had been a brain abscess and discharged the patient with the following diagnoses: 1. Puncture wound of the roof of the right orbit. 2. Pneumo-encephalocele (traumatic). 3. Brain abscess suspect.

Discussion

The absence of neurologic signs in this case brings out the well-known fact that the frontal lobe is the "silent area" of the brain and emphasizes the tolerance this area has for trauma. This is especially true of that portion of the lobe opposite Broca's area.

The presence of gas could be accounted for in three ways:

1. Air introduced into the wound at the time of the injury. This is hard to suppose in that the volume of air was so great.

2. The air could have been forced into the frontal lobe along a channel from the paranasal sinuses, which the instrument penetrated on its way into cortical tissue; but X-ray studies showed no frontal nor ethmoid sinuses on that side. The localization of the puncture wound was lateral to the midline; that is, away from the sinus area.

3. Gas accumulating from gas-forming bacilli in the frontal lobe. The gas infection could have been established in one of the following ways: implantation directly into cortical tissue by the penetrating instrument, or extension from adjacent tissue along blood vessels, or directly through barriers. If the extension was by tissue spread, more superficial infection should have been observable. Grant,[1] in his review of brain abscess, states that an abscess rarely occurs unless the dura is penetrated. Later he states a brain abscess forms relatively rapidly after penetrating injury. The abscess here was well established 20 days after injury, when X-ray evidence was obtained of the abscess. It was undoubtedly formed earlier, as compared to the time element in Tuffier's and Guillian's[2] series.

The most logical reason for the presence of air in the frontal lobe is that it was inoculated by direct implantation, the bacillus having been introduced with the pencil. Thus a colony of the organisms could have been planted deep in cortical material or an infected tract left to the gas-containing cavity communicating with the skin surface.

In Bagley's[3] review of brain abscess containing gas where cultures were obtained, the causative agent was Clostridium aerogenes capsulatum. However, in the majority of his cases only clinical evidence of gas-forming bacillus infection was obtained, which was also the situation in this case. Gas was obtained from the lid wound on one occasion, although the lid had been opened three days previously and was reopened daily. This would indicate the formation of gas in the orbital tissue, or else the gas passed down a patent tract from the gas-containing area to drain on the skin surface. The odor and consistence of the drainage material would not suggest a gas-forming bacillus infection, however.

The localization of this abscess by X-ray examination would place it below the cortex, or starting there and thinning the cortex over it (fig, 1). Atkinson[4] states that a brain abscess forms just below the cortex in the flat sheet of white matter, which is a relatively avascular zone. In the case of a penetrating wound the tract is cut off from the underlying abscess by the cortex with its relatively good blood supply. The possibility, however, of a communicating channel or tract between abscess and the drainage incision must be considered. The fact that gas was seen

coming from the wound on one occasion only, and that the amount of drainage of purulent material was out of proportion to the apparent lid involvement would seem to establish the existence of a tract which could have been cut off later in the course of the disease.

Symptoms in this case were minimal, the ocular signs of brain abscess present here were only minimal blurring of the disc margins and some venous engorgement in the right eye. Benedict[5] states that this is infrequent and does not always occur on the side of the lesion. Other ocular signs of frontal-lobe abscess—such as, swelling of the lids, chemosis of the conjunctiva, pain about the eye, exophthalmos—were of no value here as the orbital infection complicated the picture. There was no abducens paresis. Visual fields were not taken, for the patient could not coöperate.

Summary

This case of pneumo-encephalocele, discovered only by radiographic studies, indicates the possibilities of deeper injuries following puncture wounds of the orbital region. This marks the orbital plate as a particularly vulnerable area. The origin of the gas within the cranial vault is questionable, but could be answered by gas-forming organisms planted in cortical tissue through the orbital plate by the pencil on which the child fell. The rapid recovery and lack of symptoms were outstanding features of this case.

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OPHTHALMOPLEGIA AND RETINAL DEGENERATION

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A number of authors have reported diverse neurologic changes associated with various forms of retinal degeneration. This association is most frequently seen in cases of cerebromacular degeneration or amaurotic familial idiocy, the juvenile form of which was described by Spielmeyer-Vogt. In these cases the pigmentary degeneration (retinitis pigmentosa) may be typical[1, 2] or atypical.[3] More rarely associated with pigmentary degeneration of the retina are progressive spastic paraplegia,[4] flaccid paraplegia with atrophy,[5, 6] variations of cerebello-pyramidal syndrome,[7, 8, 9] Friedreich's ataxia,[10] and progressive dementia.[11, 12] In all the reported cases more than one member of the family was affected. In the Laurence-Moon-Biedel syndrome, which includes pigmentary degeneration of the retina,[13] the patients involved in the original cases reported by Laurence and Moon later developed paraplegia.[14] There are, however, no reports of ophthalmoplegia complicating cases of retinal degeneration.

Four cases of various types of retinal degeneration complicated by ophthalmoplegia have recently been seen by the authors. In all these cases various other factors—postthyroid state, syphilis, or microcephaly—were present which might possibly account for the ophthalmoplegia. Nevertheless, in these cases the association of ocular-muscle palsies and retinal degeneration appeared to be more than a coincidence and suggested the possibility that degeneration in the retina and in the nerves to the extraocular muscles may be a syndrome due to some common factor.

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The four cases are, in brief, as follows:

Case 1.[15] K. P., a white woman, aged 43 years, had at the age of 5 years developed a left facial paralysis and internal squint following convulsions. At the age of 33 years her vision began to fail in both eyes. At 34 a thyroidectomy was performed, following which some questionable proptosis of the left eye was observed. When seen three years later there was partial limitation of all movement of the right eye and limitation of downward movement of the left eye. There was no exophthalmos at this time, although the lid fissures were abnormally wide and there was a lid-lag. Lenticular opacities prevented study of the fundi. Her vision was 1/200 in the right eye and light perception above only in the left eye. The cataract was removed from the right eye and the fundus showed a pale optic disc, narrow retinal arteries, and numerous deposits of pigment throughout the fundus, giving a typical picture of retinitis pigmentosa.

Case 2. G. F., a colored woman, aged 31 years, was known to have had a positive serologic test for syphilis for six years. She received, little, if any treatment. After a normal delivery at the age of 29 years, she had a series of major convulsions which left her with mild pyramidal signs. Positive blood and spinal-fluid serologic tests for syphilis were obtained, but she received no antiluetic therapy. Nine months later she was admitted to the psychopathic division of the Baltimore City Hospitals in acute mania. Her eye movements could not be adequately tested, but there was a divergent strabismus. Malaria therapy was given, the evidences of paresis cleared, and the serologic tests returned to normal. About one

year later she was readmitted to the Baltimore City Hospitals because of stomatitis. She had no more convulsions and was clear mentally. Serologic tests were negative. Her vision had been decreasing, and she had had diplopia on reading for the past year.

There was bilateral external ophthalmoplegia, complete except for the superior-oblique muscles supplied by the fourth cranial nerve. There was a slight downward motion of the eyes bilaterally but no voluntary motion upward. Bell's phenomenon, however, was present. At rest there was a bilateral ptosis. The pupils were equal, round, and regular, and reacted to light and accommodation. The left pupil dilated on looking to the left forcefully. Convergence was poorly performed.

Near vision was normal. Visual fields were normal to finger test, but the patient did not report to the eye clinic for accurate measurements of fields and vision. The optic disc and vessels were normal. The retina was normal except in the extreme periphery where there were numerous scattered corpuscularlike deposits of pigment.

The remainder of the neurologic examination revealed no abnormalities. Injection of prostigmine produced no change.

Case 3. E. R., a colored woman, aged 18 years, was admitted to the Johns Hopkins Hospital in 1935, complaining of having had difficulty in walking for three months. Except for one uncle, who died at the age of 58 years, having been blind and unable to walk for one year, the family history was noncontributory.

One year previous to this admission she had had a labial sore, and three months previously she had a positive serologic test for syphilis and received a single intravenous injection. From that period on she had increasing night blindness, thickness of speech, difficulty in walking, with stumbling, and clumsiness of the hands.

There were partial bilateral sixth- and third-nerve palsies, slight right facial weakness, spasticity of the legs, unsteady gait, slight dysdiadokokinesis, and past pointing. Increased deep reflexes and patellar clonus were found on the left, and there was a bilateral Babinski reaction. A roentgenogram of the skull showed some atrophy of the cranial bones. The fundi were normal except for slight narrowing of the retinal vessels. Visual fields showed a small central scotoma on each side. Vision was 20/70 in each eye.

Antiluetic therapy was given from 1935 to 1937, when she disappeared from observation and received no further treatment. At no time was a positive serologic test for syphilis found in the spinal fluid. From 1937 on she had increasing difficulty with her gait until her admission in October, 1941, when she could not walk at all. In July, 1941, her vision began to decrease and her speech became increasingly labored and indistinct.

On admission, in 1941, her general physical examination was normal. There was bilateral optic atrophy. The vessels of the retina were extremely narrow and atrophic. The macula was the site of extreme degeneration bilaterally, and there was a hole in the center of each area of degeneration. The entire retina appeared atrophic, having a greenish fluorescent sheen due to diffuse fine pigmentary stippling. In the extreme periphery, a few heavy deposits of pigment were seen. Vision was reduced to light perception in each eye. The pupils were dilated and reacted to light slowly and incompletely.

There was no movement of either eye in any direction, either on voluntary effort, in response to caloric stimulation of the vestibular apparatus, or on Bell's

maneuver. The left eye looked forward, the right eye down and outward.

There was slight weakness and marked spasticity of all four limbs. There were no involuntary movements, fibrillations, or muscular atrophy. No ataxia was elicited on heel-to-knee, or finger-to-nose tests. Speech was slow, monotonous, and labored. No sensory disturbances could be found. All deep reflexes were hyperactive, and there was a bilateral Babinski response. She appeared retarded mentally. Later she developed bilateral atrophy and fibrillation of the tongue.

Blood, urine, and spinal-fluid examinations, including serologic tests for syphilis, were normal. A bromsulphalein liver-function test was well within normal limits.

Case. 4.[16] This 31-year-old white man came to the Out-Patient Department of the Johns Hopkins Hospital complaining of inability to raise his eyelids or to move his eyes. He also complained of a speech defect and deafness. There was no family history of mental or developmental defects nor of eye lesions of any nature.

Except for measles, his childhood had been healthy. Following a tonsillectomy at the age of 12 years, it was noticed that the patient was hard of hearing and had some decrease in vision, and he was taken from school. These signs gradually increased. At the age of 14, his speech began to be defective; and at the age of 27, he began to develop bilateral ptosis. About a year later, ataxia developed. He was admitted to the Hospital for study.

The general physical examination was normal. Neurologic examination showed the patient to be poorly developed, with a slender bony structure. The head was microcephalic with a high vertex. Vision was 6/50 without correction. The retinas were described as atrophic. The pupils were large and reacted sluggishly to light. There was bilateral ptosis and loss of all ocular movements. The patient had severe, bilateral nerve deafness. The rest of the cranial nerves were intact. There was no muscular atrophy. There was oscillation of the head and trunk, with cerebellar ataxia in the arms and legs. Speech was indistinct and slow. There was no sensory loss. The tendon reflexes were all active and equal, abdominal reflexes were active, plantar responses flexor, and there was no clonus nor Hoffmann's reflex.

External examination of the eyes revealed a partial bilateral ptosis. The ocular movements were limited to excursions of about 4 degrees in each direction, and convergence was absent. The lacrimal apparatus, conjunctivas, and corneas were normal. The pupils were equal, and the pupillary reactions to direct and consensual light and to accommodation were normal.

In the right eye, the disc appeared of good color, but was surrounded by a whitish ring about one-fourth disc diameter across, with a very slight pigmentary disturbance. There was a generalized diffuse degeneration throughout most of the retina, most marked in the macular regions, consisting of a stippled appearance with fine pigmentary disturbance. In the far periphery, there was a general lack of retinal pigment so that the choroidal vessels were plainly seen. The retinal vessels appeared essentially normal.

Slitlamp examination and tension were normal.

Vision in the right eye was 10/200, in the left eye, 20/50−2.

Nose-and-throat examination showed that the levator muscles of the palate were paralyzed. There was a severe nerve type of deafness and negative vestibular response. Roentgenograms of the sinuses, optic foramina, and sella turcica were normal. The pineal was calcified. Blood

counts, urinalysis, and blood serology were all normal. No examination was made of the spinal fluid. Head measurements indicated dolichocephaly.

The patient was discharged with a diagnosis of progressive nuclear ophthalmoplegia; bilateral ptosis; nerve-type deafness; severe paralysis of levator muscles of palate; negative vestibular response; cerebellar ataxia, and retinal degeneration. He did not return for further examination.

Summary and Conclusions

Four cases of various types of retinal degeneration with complicating ophthalmoplegia are reported. Although other factors were present which might account for the ophthalmoplegia, it was felt that the association is more than a coincidence. It is suggested that the two constant features in these cases, ophthalmoplegia and retinal degeneration, with secondary pigmentary changes may be a syndrome due to some common etiologic factor.

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THE USE OF DORYL IN GLAUCOMA

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For a number of years the writer tried using doryl in an aqueous solution in the treatment of glaucoma, but with unpredictable results. After hearing a paper by O'Brien and Swan, given before the American Ophthalmological Society in 1941, in which they showed good results by using doryl in the surface-tension-reducing agent, zephiran, he began using doryl 1.5 percent in zephiran .03 percent, as advised by these authors.

No attempt will be made here to give the chemical formula or physiologic action of doryl, for this is covered fully in the paper cited.

All of the present writer's cases in which doryl was used were those which did not respond well to the usual glaucoma treatment, for some reason or other. Results obtained in such cases should be doubly valuable. It was used in many more cases than those here cited, but these few are the ones which came readily to mind. With the Schiötz tonometer used, any tension of 25 mm. Hg is at the upper limit of normal.

Case 1. Miss C. D., aged 64 years, was first seen on June 15, 1940, because of chronic, simple glaucoma in each eye. Tension, right eye, was 30 mm. Hg; left eye 40 mm. Hg. The discs showed glaucomatous cupping and the left eye showed a well-marked field defect. Pilocarpine in oil, 2 percent, and eserine in oil, 1 percent, each three times a day alternating, were prescribed, but the tension was always at or above the upper limit of normal. In July, 1941, the patient was placed on doryl, 1.5 percent four times daily, and all other drops were omitted. The tension came down to well within normal limits and has remained so.

Case 2. A. C. M., aged 64 years, was first seen in June, 1936. He had been under the care of another oculist for glaucoma and was using pilocarpine several times daily. The pupils were of pinpoint size, but in spite of this the tension was 35 mm. Hg each eye. Both eyes showed cataractous lens changes and the best vision with correction was right eye 20/100, left eye 20/60. With pilocarpine, 1 percent twice daily, and eserine in oil, 1 percent twice daily, the tension remained between 30 and 35 mm. Hg in each eye. In October, 1936, a glaucoma operation was performed on the left eye, and the tension has remained well under control ever since. The tension of the right eye remained above 30 mm. Hg. This eye was operated on for glaucoma in December, 1936. Following the glaucoma operation on the right eye, the tension was reduced for a short while and then returned to the former level. One year later the right eye was again operated on for glaucoma, following which the tension remained normal for a short while and again went to 35-40 mm. Hg, and could not be controlled by any remedies tried, including epinephrine bitartrate. On two subsequent occasions this eye had further glaucoma operations, none of which gave relief. In March, 1939, a cataract extraction was performed in the hope that this would relieve the tension, but it did not. The tension remained around 55 mm. Hg, and the eye was gradually deteriorating. In July, 1941, the patient was placed on doryl, 1.5 percent. The tension was reduced from 55 to 30 mm. Hg, but the doryl caused so much discomfort its use could not be continued.

Case 3. E. F. M., a man, aged 82 years, was first seen on October 7, 1942. He had

glaucoma simplex. Tension O.D. was 35 mm. Hg, O.S. 40 mm. Hg. He was given pilocarpine, 1 percent, to be used four times daily. Under this regimen the tension of the right eye was brought down to 30 mm. Hg, while that in the left eye remained at 40 mm. Hg. The patient did not come in regularly, but in spite of the administration of pilocarpine, 1 percent four times daily, the tension remained 30 mm. Hg in the right eye and 40 mm. Hg in the left eye, until June, 1943. Eserine was applied but had to be discontinued because of the discomfort it produced. On June 16, 1943, doryl, 1.5 percent, was instilled in the left eye, and the tension, which had been 40 mm. Hg, promptly fell to 20 mm. Hg. Doryl, 1.5 percent, was ordered to be used twice daily in each eye along with the pilocarpine, 1 percent, twice daily, in each eye. The tension has remained at 22 mm. Hg in the right eye and 25-27 mm. Hg in the left eye ever since.

Case 4. Mrs. W. D. W., aged 50 years, was first seen on December 11, 1942, because of lid trouble. The optic discs were found to be cupped, and the vessels were pushed to the nasal side. Intraocular tension was right eye 35 mm. Hg, left eye 30 mm. Hg. Pilocarpine, 1 percent, was prescribed, to be used four times daily in the right eye and twice daily in the left eye. In spite of this the tension remained at slightly above 30 mm. Hg in the right eye and 25-27 mm. Hg in the left eye. On June 4, 1943, doryl, 1.5 percent, was applied to the right eye, and the tension fell from 30 to 25 mm. Hg. The patient was given doryl, 1.5 percent, to be used twice daily in the right eye, in addition to pilocarpine, 1 percent, twice daily. She complained some of blurring of vision in the right eye after the use of doryl, but the tension has remained at 20 mm. Hg since the use of doryl was initiated.

Case 5. E. F. D., a man, aged 81 years, was first seen on May 27, 1941, because of a chronic, low-grade glaucoma which, from the history, evidently became worse at times. He was put on pilocarpine and not seen again until July 1, 1941. Then he was seen in the hospital because of an injury to his back suffered in a fall. He had developed congestive glaucoma in the left eye with steamy cornea, dilated pupil, and tension of 60 mm. Hg. This congestive glaucoma responded well to treatment within a few hours, but on July 6th, five days later, he developed congestive glaucoma in both eyes with a tension of 80 mm. Hg, in each eye. Both eyes again responded well to treatment and returned to their former noncongestive glaucomatous condition. Since then the tension of the right eye has remained within normal limits under pilocarpine therapy, 1 percent, but the tension in the left eye has remained at 50 mm. Hg. On October 30, 1943, the tension in the left eye was 55 mm. Hg. Doryl, 1.5 percent, was used and reduced the tension to 30 mm. Hg within an hour; the first time it had been below 50 mm. Hg in a year. The patient was given doryl, 1.5 percent, to be used in the left eye twice daily and all other miotics were to be omitted in this eye. He continued the pilocarpine, 1 percent, twice a day, in the right eye. When next seen on November 19th, practically three weeks later, the tension was 22 mm. Hg in each eye.

Case 6. Miss M. F. S., aged 71 years, was first seen on July 5, 1933. Intraocular pressure was slightly over 30 mm. Hg right and left, and the form fields were defective. With pilocarpine, 1 percent twice daily, the tension remained well within normal limits. After continued use of the pilocarpine, she developed marked lid irritation. Eserine, 0.5 percent, was substituted for the pilocarpine and maintained normal tension, but this also soon gave rise to marked lid irritation. In Au-

gust, 1943, doryl, 1.5 percent, was substituted for the eserine and the pilocarpine, and maintained the tension at 20 mm. Hg in each eye when used once daily. The lid irritation cleared rapidly and the patient was quite happy with this new medication. In September, 1943, doryl was unobtainable at the local pharmacies, so the patient went without a miotic for several days. When she returned, ocular tension was from 30 to 35 mm. Hg in each eye. Pilocarpine, 1 percent, was resumed and maintained normal tension but soon had to be stopped because of extreme lid irritation. Doryl again being available, it was resumed on October 30th and has maintained normal tension in each eye. There has been no lid irritation.

Case 7. Mrs. C. B., aged 45 years, was first seen in 1930 because of cataracts and old vascularization of the corneas as from old interstitial keratitis. She gave a history of blindness in early life. Blood tests were negative. In 1931 a cataract extraction was performed on the right eye. Some time later the patient developed noncongestive glaucoma in the right eye which was controlled by miotics for some time. However, in April and May, 1943, the tension remained up to 40 mm. Hg in spite of the use of pilocarpine in oil, 2 percent, and eserine in oil, 1 percent, each applied three times daily. On May 18th, the tension was 35 mm. Hg. Doryl, 1.5 percent, was used, and within 40 minutes the tension was reduced to 22 mm. Hg. This was now ordered to be used night and morning in addition to pilocarpine, 1 percent in oil, twice daily. Since then the tension in the right eye has remained at 22 mm. Hg.

Case 8. J. H. H., a man, aged 64 years, was first seen on April 22, 1943, because of chronic, simple glaucoma, right eye, and absolute glaucoma in the left eye, with no light perception in the latter. Tension was 55 mm. Hg in the right eye; in the left it was too high to be measured. Under pilocarpine, 1 percent, and eserine 1 percent, each applied twice daily, the tension of the right eye was reduced to range between 30 and 35 mm. Hg, while the left eye was not influenced. Doryl, 1.5 percent, was used in each eye and brought the tension of the right eye down to 22 mm. Hg and of the left down to 60 mm. Hg. However, doryl caused exquisite pain in the eyes and even syncope; it was therefore discontinued.

Case 9. Miss N. M., aged 57 years, was first seen in March, 1941, for refraction. She was found to be suffering from chronic, simple glaucoma with the intraocular pressure in the right eye 27 mm. Hg, in the left eye 30 mm. Hg. Under pilocarpine, 1 percent, twice daily, the tension came down to normal and with correction her vision was 20/20, each eye. This patient was not seen again until September of 1943, two-and-one-half years later. At this time the vision was still 20/20 in the right eye but down to 20/75 in the left eye with best correction. She had used no drops of any kind for a long time. The intraocular pressure was right eye 30 mm. Hg, left eye 70 mm. Hg. With pilocarpine, 1 percent, twice daily in the right eye and four times daily in the left eye, the tension came down to right eye 25 mm. Hg, left eye 35 mm. Hg. Eserine, 1 percent, was ordered to be used twice daily in the left eye in addition to the pilocarpine, 1 percent, twice daily. With this medication the tension of the left eye still remained at 30 mm. Hg, or above. On November 8th, doryl, 1.5 percent, was ordered to be used twice daily in the left eye, replacing the eserine oil, and the pilocarpine, 1 percent, was continued twice daily. Ten days later the tension in the left eye was down to 25 mm. Hg.

From the foregoing cases, it can be seen that doryl is not effective in all cases of glaucoma and in some cases is even contraindicated. However, from the writer's experience in these and many other cases not cited, it would appear that doryl when used in the surface-tension-reducing agent, zephiran, is a valuable adjuvant in the treatment of glaucoma.

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KERATOCONJUNCTIVITIS CAUSED BY THE MANZANILLO TREE*

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The reaction of the eye from contact with the manzanillo (beach apple) tree has been noted in the Caribbean area for a number of years.

In the days of the early Spaniards, it was supposed to have caused "blindness," and this belief is yet extant, especially among a large native population in this area. Although the inhabitants who are in the vicinity of the manzanillo are quite aware of the toxic effect of the plant, certain circumstances have reawakened interest in this problem. The large number of troops, many of whom are stationed near these poisonous trees, has made it imperative that they all be given warning of the toxic nature of the beach apple tree.

Hippomane mancinella L. (Euphorbiaceae) is an attractive, round-topped tree, averaging 15 to 25 feet in height,

FIG. 1 and 2 (Harley). The manzanillo tree. FIG. 1. A manzanillo tree on a sea beach in Panama. FIG. 2. The fruit of the manzanillo or beach apple.

common to the sea beaches of Central America, the northern coasts of South America, the West Indies, and Florida. The small green fruit, about an inch in diameter, looks not unlike the crabapple of North America. The leaves resemble those of a cherry tree, and the flowers are green and arranged in stiff spikes (figs. 1 and 2).

The leaves and branches when broken exude a milky latex which is extremely irritating to the mucous membranes and

* The manzanillo is also known as the beach apple in Panama and as the manchineal in Jamaica and Trinidad.

skin,† causing a marked inflammation and vesiculation similar to that produced by *Rhus toxicodendron*. The conjunctiva appears particularly vulnerable to this toxic latex, and the severe keratoconjunctivitis thus produced causes such blepharospasm that it is commonly referred to as "blindness."

Seeman, in his recording of the voyage of H.M.S. *Herald,* states that some of the ship's carpenters were blinded temporarily by the sap getting into their eyes while cutting down some of the trees.[1] Richard Ligon also, in "A true and exact history of the Island of Barbados" (1673), says of the cutting of the trees: "The fellers as they cut them down are very careful of their eyes and those that have Cipers put them over their faces, for if any of the sap fly into their eyes they become blind for a month."[2]

There is evidence that a heavy dew will bring the toxic sap from the branches to the exposed parts of anyone beneath the tree.

Recently some troops on night maneuvers, having completed their mission, fell asleep beneath the sheltering trees of the beach. Within a few hours many were awakened by a burning about their eyes and faces. Sixty men had to be hospitalized because of the severity of the reaction but all recovered completely (Satulsky[3]).

Clinical features

Four cases of acute keratoconjunctivitis resulting from contact with the manzanillo tree have been seen at Gorgas Hospital in the past year. In each case there was an accompanying dermatitis venenata chiefly distributed to the face, arms, trunk, and the penis (which had been contaminated during the act of micturition).

The ocular findings in manzanillo poisoning are similar to any severe contact keratoconjunctivitis. The patient invariably gives a history of bodily contact with the tree. By careful questioning and a knowledge of the predilection of these trees for sea beaches, a positive identification of the beach apple tree can be made. Burning, lacrimation, and some blepharospasm are noticed from a few minutes to an hour following contact. The eye symptoms rapidly develop into frank pain and total inability to keep the lids open or even to allow the lids to be manually opened. The dermatitis does not become evident until a few hours later.

The patients are characteristically led into the office with both eyelids tightly closed, lacrimating profusely, and in obvious pain. The eyelids are often markedly edematous and may present some form of vesicular eruption on the thin skin surface. In severe cases, a tongue of red, edematous or even chemotic conjunctiva may appear between the eyelids. Fluorescein stain will show that the corneal epithelium and scattered areas of the conjunctival epithelium are denuded. The vision is reduced in proportion to the extent of the damaged corneal epithelium. The remainder of the ocular examination shows nothing else of pathologic importance. With the exception of the irregularly distributed dermatitis, the general physical examination is negative. The routine laboratory tests show a rather persistent eosinophilia, but are otherwise negative.

The treatment of the keratoconjunctivitis is directed toward making the patient as comfortable as possible, preventing infection, and waiting for the cornea to reëpithelize in its normal fashion.

A 0.5-percent solution of pontocaine or

† The active principle of the poison in the sap of the manzanillo tree has not been ascertained.

pontocaine ointment is particularly effective as an anesthetic and its application should be the first step in the treatment after the history of contact with the vegetable irritant has been ascertained.

After the patient has thus been given some measure of relief, the conjunctival sac is irrigated with copious quantities of normal saline solution. Bed rest, cold boric-acid compresses for the lids and conjunctival edema, and enough pontocaine ointment to keep the patient reasonably comfortable make up the remainder of the treatment for the eyes. Although, the patient's eyes feel comfortable within a relatively short time, it has been observed that the cornea takes the fluorescein stain up to five or seven days after the initial contact. The original vision is restored at this time. Corneal ulcers have been observed to persist in certain neglected cases.[4]

The dermatitis can be satisfactorily treated with boric-acid compresses for the face and calamine lotion for the rest of the involved skin. The dermatitis venenata is usually cleared up about the same time that the eyes have healed.

Experimental work*

In an attempt to study the toxic agent of the manzanillo tree, a series of skin tests was tried in an endeavor to find: first, the most toxic part of the tree; and, second, the most effective means of eradicating the toxin once it has been contacted.

For the first problem, 14 individuals were each patch tested with the leaf, the peelings of the fruit, and the sap. It was easily determined that by far the preponderance of toxicity is resident in the sap, although in a few cases the peelings likewise produced a maximum blister. It was thought that the latter had possibly been contaminated by the sap.

In regard to the second problem, another series of skin tests was made in which the sap alone was used. After the sap had remained in contact with the skin for one-half hour, it was removed by ether, soap and water, sea water, or lime juice.† One area in each case was left untreated and acted as a control. These prophylactic agents were found to be effective in the order named.

For many years it has been known that there is a simple and effective remedy always at hand; that is, sea water. Our results confirmed the efficacy of sea water as a prophylaxis, but, in addition, it was seen that ordinary soap and water is even more effective in removing the sap from the skin.

The toxic effect of manzanillo sap on the rabbit's eye was then studied. A small drop of the fresh sap was instilled into the superior cul-de-sac of the normal eye of a white rabbit. Mild blepharospasm and photophobia were noted within 60 seconds. Conjunctival injection and chemosis were pronounced at the end of one-half hour. At the end of five hours, a maximum effect was produced, consisting of marked blepharospasm, lacrimation, conjunctival redness, and chemosis extending on to the nictitating membrane. A thick mucopurulent discharge was noted. Fluorescein stain showed scattered areas of denudation on the upper conjunctiva and cornea. Within 24 hours, the conjunctival reaction had nearly subsided except for a residuum of lacrimation and conjunctival injection. At the end of 48 hours the eye appeared completely well.

Having obtained a satisfactory control

* The experimental work was done in conjunction with James S. Snow of the Dermatology Department and the details of the experiments will appear in another publication dealing more fully with the dermatologic aspects of manzanillo poisoning.

† Lime juice is a native remedy for ocular involvement.

on the toxic effects of the sap, we entered upon another experiment, to ascertain the expediency of saline irrigations as a prophylactic agent following contact with the beach apple.

A second healthy rabbit's eye was selected for the sap instillation. Fifteen minutes following the instillation, the affected eye was irrigated with 4 ounces of normal saline solution. The eye was observed every 15 minutes for one hour and then five hours later. The resulting keratoconjunctivitis was in every respect the same as that of the eye which had not been irrigated with saline.

A drop of the toxic sap was then instilled into a third healthy eye. This eye was irrigated with 4 ounces of normal saline solution five minutes following the topical application of the sap. At the end of five hours, the eye showed a mild keratoconjunctivitis with a few superficial staining areas on the cornea. In 24 hours the eye was normal except for a slight conjunctival injection in the superior fornix. This eye showed less reaction than the control and was well in 24 hours instead of in 48 hours.

We conclude, therefore, that saline irrigations as a prophylaxis at the end of five minutes' exposure will reduce but not prevent the keratoconjunctivitis resulting from the sap of the manzanillo tree. In the rabbit's eye the healing period was reduced by about one half.

It is our opinion, based on studies with this vegetable irritant, that prompt and repeated immersion in the nearby sea water with lids open will mollify, if not wholly eradicate, the toxic effects of manzanillo sap in the eyes. This procedure offers the best form of first aid until medical aid can be obtained.

Summary

1. A severe keratoconjunctivitis and dermatitis result from the irritating action of the manzanillo or beach apple tree common to the sea beaches in the Caribbean area.

2. Blepharospasm, conjunctival edema, and denudation of the conjunctival and corneal epithelium are the most characteristic findings.

3. Treatment for the eyes consists of saline irrigations, cold compresses, anesthetic instillations, and ocular rest. The dermatitis responds to bland wet dressings and calamine lotion.

4. Patch tests showed that the sap of the tree possesses the most irritative qualities. Sea water and soap and water for the skin are the most effective, practical, and immediate means at hand of combating the irritant.

5. Experiments on a rabbit's eye showed that the toxic action of the sap could be modified by the prompt use of saline irrigations.

6. Recommended prophylactic measures consist of bathing in sea water with the lids open, followed by a thorough cleansing of the skin with soap and water.

Gorgas Hospital.

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ACTINIC KERATOCONJUNCTIVITIS*

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The acute inflammatory reaction of the superficial parts of the eye to short-waved light, called *photophthalmia* by Parsons in 1913, has been known and recorded since early times. Xenophon[1] in his "Anabasis" mentioned one of its forms—snow blindness. The best-known form today is the so-called *flash burn* of the eyes, usually a result of exposure to the welder's arc. We should like to suggest a routine of therapy in such cases and comment particularly upon the use of adrenalin as a means of markedly decreasing the duration and severity of symptoms.

ETIOLOGY

Histaminelike substances are products of normal cellular metabolism. They dilate minute vessels and thereby direct blood preferentially to those parts where metabolism is most active and the needs of nutrition therefore greatest.

Antagonists of these histaminelike substances (hereinafter referred to as histamine) are adrenalin and pituitrin. The action of the latter (vasoconstriction) is less powerful than that of the histamine (vasodilation). The complete reaction produced by histamine is three-fold, the *triple response* of Lewis:[2] (1) primary and local dilation of minute vessels; (2) local increase in permeability of capillary walls; (3) widespread dilation of neighboring arterioles. The triple response is brought about by a local nervous reflex. The complete triple response is elicited after any trauma which is sufficient to liberate histamine from the cells. The output of histamine seems to be controlled by impulses *descending* the sensory nerves (antidromically), presumably because these nerves control the actual metabolism of the cells.

Radiant energy (heat, light, ultraviolet) dilates capillaries through the same mechanism, histamine being liberated by the direct action of the radiation. *After* the liberation of histamine has produced a *well-marked* vasodilation with an increased capillary permeability, any attempt to constrict the blood vessels is quite without effect; this state is termed one of *unresponsiveness.*

As elsewhere in the physical world, so in the eye—it is only the rays that are *absorbed* that can exert any effect upon the substances they traverse (Draper's law); those that are reflected or transmitted can have no action, deleterious or otherwise, upon them. Light that is absorbed may produce any or all of three effects: (1) thermal effect, (2) abiotic effect, and (3) fluorescence. We shall concern ourselves primarily with the second of these; that is, the abiotic or photochemical effect.

For practical clinical purposes, it has been found that only rays shorter than 3,000 A.U. may be considered abiotically active. The reaction comes on after a

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latent period of 8 to 12 hours, varying with the intensity of exposure. It is found, as might be expected, that the cornea is especially sensitive to ultraviolet light. It is sensitive not only because of its absorption but also because of its rich supply of nerve endings which, incidentally, are peculiar to the eye.

Widmark[3] in 1889, using rabbit eyes and a 1,200 candle-power arc, produced a typical photophthalmic reaction (that is, an acute conjunctivitis with chemosis and a purulent secretion, a desquamation of corneal epithelium—and, with stronger doses, formation of corneal opacity, miosis, and iris discoloration.

Even a slight abiotic reaction over a large area of cornea is extremely painful. Such a reaction is the real basis of photophthalmia or snow blindness and may occur in typical form in flash burns of the eye following exposure to the welder's arc.

Pathology and Physiology

It might be parenthetically stated here that the object of tissue irradiation is to produce a mild skin reaction that is accompanied by changes in the blood and in the tissues resembling in some ways those occurring in foreign-protein shock.

The histologic appearance of the fully developed reaction is characteristic. In the cornea, initially, there is nuclear chromatolysis associated with a swelling and edema of the cytoplasm. Thereafter, acidophil staining becomes evident in the nucleus which progresses to the formation of highly refractive red granules within it; these coalesce into discrete "inclusion bodies," which may eventually replace the whole of the nucleus. Finally the inclusions may be extruded from the nucleus into the cytoplasm and thereafter the cell dies; if superficially located, it is desquamated.

Meanwhile, in the surrounding tissue (conjunctiva), there is a considerable vascular reaction, the most interesting feature of which is an *eosinophilic* infiltration. Many nuclei of superficial cells take on a red stain, but no definite inclusions are formed. The superficial layers of tissue become largely swollen and many cells desquamate, leaving a rough, irregular surface. The subepithelial tissue shows much congestion and some chemosis and edema, while tiny interstitial hemorrhages and considerable *eosinophilic* and polymorphonuclear infiltration are evident. After mild exposures, the process may stop at any stage, and the cells return to normal in appearance and in staining reaction. Two features of the process of resolution are characteristic: (1) the rapidity of recovery of traumatizel cells with proliferation of fresh cells to replace exfoliated ones; (2) the comparative absence of mitotic activity in the process of repair.

The actinic rays are absorbed into the protein molecule, producing photochemical changes of denaturation, in reality an acidophil degeneration. When the reaction is pushed to extremes, the result is coagulation of the proteins and eventual death of the cell. In the cornea, the reaction is seen most typically in the epithelium and to a lesser extent in the substantia propria. Any degree of change may occur and an opacity may be produced on severe exposure. Clinically, keratitis thus produced together with an associated conjunctivitis is *actinic keratoconjunctivitis,* photophthalmia, or snow blindness. The fact that the cornea itself absorbs most of the abiotically active rays greatly diminishes the severity of the action on the structures within the eye[2]

Clinical course

Initially there is a latent period during which no effects are visible. It is interesting to note that between the end of this

latent period and the commencement of acute symptoms, at the time when corneal edema is very obvious, and when in the human subject typical halos[4] are most evident, the cornea becomes practically *anesthetic!* The latent period varies in length inversely as the severity of exposure, averaging 8 to 12 hours.

At the end of this time, there is noted a rapid onset of severe, sharp, continuous ocular pain, associated with profuse lacrimation, photophobia, and later with blepharospasm. At this time the cornea shows a slight irregularity of its reflex and a stippling of its surface which takes on a fluorescein stain. Even before the onset of corneal pain, the patient may experience a prickling sensation about the eye, may see halos about lights (due to corneal edema), and there is an erythema of the skin of the lids on the side involved. On the average, blondes seem more susceptible than brunettes.

The corneal-staining area gradually increases centrally, owing to desquamation of epithelium, but the edges of the area involved rarely show a well-defined margin. Meantime, in severe cases, the central part of the cornea becomes somewhat hazy and edematous, definite vesicles being occasionally formed under the epithelium; these rupture quickly, leaving punctate, densely staining areas. It is of interest that if a severe corneal infiltrate is produced, it is usually near the limbus, although invariably separated from it by a narrow zone of clear cornea.

Simultaneously with the development of the corneal haze, the conjunctiva becomes pink and hyperemic, the inflammation gradually increasing in intensity until it involves edema and chemosis and the appearance of a varying amount of secretion which eventually may become frankly purulent.

The iris is also affected. Apart from the iris irritation and spasm accompanying any corneal infiltrate (resulting in miosis), severe flash burns produce a miosis which even atropine will not overcome for a time. There is evidence, in fact, to show that ultraviolet light acts *directly* on the iris musculature to produce miosis independent of that occurring as an irritative reflex. Superficial vessels in the iris stroma are dilated and small petechial hemorrhages may appear. An aqueous flare is present, but practically no cells appear in the anterior chamber.

The clinical picture is at its height in 36 to 54 hours after irradiation. Thereafter it gradually subsides until in four or five days the cornea becomes clear again, the conjunctival injection dies down, and the eye becomes normal in 8 to 10 days' time.

Treatment

We have utilized the following routine of therapy and feel that the results have been satisfactory. Once the diagnosis is made, the patient is rendered comfortable by the instillation of a corneal anesthetic; 0.5 percent pontocaine is a good, quick-acting one.

Following anesthesia, three instillations of 1:1,000 adrenalin at five-minute intervals are made; if the case is seen *soon after* the onset of ocular pain and *before* vascular congestion has reached a *maximum,* this is all that is necessary. That is, of course, provided the burn is not a particularly severe and deep one. Usually such patients gain immediate and frequently permanent relief, enabling them to return to work at once.

If vasodilation is marked when the patient first appears, the aforementioned routine is followed, and in addition the patient is given holocaine and epinephrin ophthalmic ointment to be used in the eye every three hours.

One valuable and early sign of a severe burn is a *miotic pupil.* One-percent atro-

pine ophthalmic ointment is always instilled, but several repetitions may be necessary before mydriasis is secured in severe cases.

In the more severe burns, or in those which are *not seen until 48 to 96 hours after the burn has occurred*, more drastic therapy may be indicated. Chemosis and a mucopurulent secretion in addition to palpebral edema are all a part of the entity of flash burn and are not on an infective basis. Cold packs and holocaine and epinephrin ointment are usually sufficient. Occasionally, a sedative is necessary.

Either corneal or conjunctival ulceration or both must be dealt with apart from the specific entity of flash burn. Corneal ulcers thus formed are very indolent and often discouragingly slow in healing. Chemical cauterization, intravenous typhoid, vitamin therapy (riboflavin and ascorbic acid), dionin, methylene-blue powder—all may be tried. As long as any corneal staining persists, it is our belief that the eye should be kept closed with an eye pad.

We claim no originality for the idea of the use of adrenalin in these cases, but at the same time we are unable to find it mentioned specifically in the literature and thus cannot give credit where credit is due.

Since in wartime the majority of flash-burn cases are in war workers, lost man-hours become an important consideration. If the course of the process can be in any way shortened, or, better still, aborted entirely, not only the patient as an individual but his employer as a wartime producer will be distinctly benefited.

Discussion

A brief reconsideration of the pathologic physiology of the flash burn will perhaps suggest possible justification for an otherwise empirical use of adrenalin. On the one hand, adrenalin is the most powerful antagonist of the histaminelike substances released in the tissues, a result of the irradiation. On the other hand, before vasodilation becomes well established (the state of unresponsiveness) the vessels will respond to adrenalin by vasoconstriction. Thus their tone is maintained, preventing circulatory stasis, with a consequent piling up of metabolites in the tissues, leading to further irritation, vasodilation, and edema.

Finally, the appearance of eosinophils in addition to the similarity of the tissue reaction to that in anaphylactic protein shock would, perhaps, indicate the use of adrenalin on purely theoretic grounds. At any rate it has been our clinical experience that early and prompt instillation of adrenalin has a distinctly beneficial effect in modifying the severity of the subsequent course of the flash burn.

Conclusion and Summary

Actinic keratoconjunctivitis or flash burn is an important industrial disease, particularly in war time. Ultraviolet irradiation is the causative agent, producing an irritative and degenerative tissue reaction. Adrenalin instillations early in the clinical course of the condition will markedly reduce the severity or even abort the condition entirely.

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CORRECTION OF EXTERNAL-RECTUS PARALYSIS WITH CONTRACTURE OF THE OPPOSING INTERNUS*

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In time of war, certain casualties are seen more frequently than appear in periods of less violence. Palsies of the extraocular muscles can be expected to be more common today because of the increased incidence of head injuries resulting from mechanized combat. Most common of all extraocular-muscle paralyses is that involving the external-rectus muscle, causing diplopia and inability to rotate the eye temporally. As Bielschowsky[1] and others have pointed out, it is by far the most frequently paralyzed isolated muscle because the abducens nerve has a longer course along the base of the skull than have the other motor nerves of the eye and it happens to be more exposed, particularly where it crosses the apex of the petrosal part of the temporal bone.

There are numerous causes for abducens palsies besides trauma, some of which call for surgical correction. Rea[2] has made a convenient clinical classification:

1. Lesions of the orbit such as accompany cellulitis, sinusitis, abscess, neoplasm, exophthalmic goiter, gumma, trauma, and hemorrhage.
2. Lesions at the base of the brain between the sphenoidal fissure and the pons caused by syphilis, inflammations, toxins, or basal-skull fracture. Gradenigo's syndrome is the name used by otologists for external-rectus palsy associated with infection of the ear.
3. Lesions of the brain stem, either nuclear or fascicular, due to syphilis, hemorrhage, encephalitis, disseminated sclerosis, polioencephalitis, myasthenia gravis, alcohol, toxins, tumors.
4. Lesions of the cerebrum, some of which are congenital.

Where cases of congenital palsies have come to surgery, one has frequently found a rudimentary externus made up solely of fibrous bands, possibly including a few isolated muscle fibers.

Since Hummelsheim[3] proposed a method of transplanting slips of functioning muscles to replace paralyzed ones, it has been known that a surgical method existed to correct the deformity, but surgeons were slow to make use of the technique. O'Connor[4] reported on his modifications, and, since then, he as well as others like Gifford,[5] Peter,[6] and Wiener,[7] have further advanced their methods and reported on clinical results.

In recent years, then, there has been evidence of more uniformity in surgical technique but at the same time a growing concern about delay on the part of neurologists and general physicians in referring the cases to ophthalmologists for treatment. The feeling is growing that patients should be seen at frequent intervals following onset of the disturbance. Ocular rotations should be studied repeatedly with two points in mind: (1) the spontaneous improvement, if any, in the function of the externus; (2) the degree of spasm and contracture of the opposing internus. O'Connor[8] stated the contracture may be measured by grasping the conjunctiva with forceps, after a local anesthetic has been instilled, and rotating the eye temporally. He proposed that operation should not be delayed after the onset of contractures even though an insufficient time had elapsed in which to make certain that function would not return spontaneously. This feeling of urgency is in agreement with Bielschowsky's[9] that "orthophoria cannot be re-

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stored as soon as a paresis is cured if the paretic deviation is caused not only by the normal tonus of the intact muscles but by the secondary contracture of the antagonist of the paretic muscle due to a change of its structure."

Whether or not anything must be done to the internus, opposing the transplants to the externus, depends on the age, the amount of contracture of the internus, and the completeness of the external-rectus paralysis. In a fairly recent case, in which there is little or no contracture, it may be possible to leave the internus undisturbed. In cases exhibiting moderate degrees of contracture and considerable deviation, a central tenotomy judiciously used will allow the eye to straighten and still not weaken convergence. In some old cases of severe contracture and extreme nasal deviation nothing less than a recession of the internus will permit a cosmetic cure at the cost of weakening the convergence power. Often the cosmetic and functional results are remarkably good even after drastic procedures on the internus which were deemed necessary to straighten the eyes.

It is a basic principle that in muscle surgery the functional result be kept uppermost in mind. A cosmetic cure, while satisfying to the patient at first, may not be adequate when he assumes special tasks which place a greater burden on his eyes and a premium on binocular vision and good convergence. While agreeing wholeheartedly with this trend of thought, the writer believes that ophthalmologists should not offer too pessimistic a prognosis when faced with an old case in which contractures have already set in. The following instances from the Eye Clinic at Stanford are presented as examples of surgery undertaken despite handicaps which yet produced results both pleasing to the patients and encouraging to the surgeon.

Few ophthalmologists have had an opportunity to study early cases of abducens palsy in any significant numbers. Most of the reports deal with the surgical treatment of old cases. This has been partly due to a reluctance to recommend operation until the possibility of spontaneous cure is remote. Not only have the general physician and neurologist been at fault in this, but the ophthalmologist as well. It is to be hoped that in the armed services, with their excellent facilities and well-trained staffs, cases arising from war injuries will receive the close attention and prompt treatment which insure a good functional as well as cosmetic result. Even when we see a patient with a neglected external-rectus paralysis resulting in a disfiguring squint, we should not forget that muscle transplantation is still indicated. A purely cosmetic repair will mean a great deal to the patient, and if, in addition, a functional success is achieved, the operation will have been invaluable.

Case reports

Case 1. F. T., a 58-year-old white female draftsman, was seen on July 30, 1942; her complaint was eye fatigue, and diplopia of 20 years' duration. The patient had noticed diplopia on looking to the right following an attack of influenza 20 years previously but the right eye was straight until two years before, when it started to deviate nasally. Vision was: R.E. and L.E. 20/25 uncorrected. There was an insignificant refractive error.

Examination of the eyes was negative except for the position and rotations of the right eye, which was deviated nasally 25 degrees in the primary position. It could not be rotated temporally beyond the midline. Secondary deviation of the left eye was extreme. There was no limitation of vertical rotation.

Procedure. Because of the moderate deviation and small degree of contracture

a central tenotomy was performed on the right internus in conjunction with an O'Connor cinch operation on the externus and transplantations of the nasal halves of the superior and inferior recti.

Result. For one week the right eye was 20 degrees divergent. In two weeks the patient had binocular vision and third-degree fusion. At the end of a month, she was able to rotate the eye 25 degrees externally and 30 degrees internally and soon returned to her drafting board. The patient has been in at intervals during the past year to recount that her diplopia is gone and she is able to carry on her war job without too much strain.

CASE 2. B. H., a 56-year-old white housewife seen on February 8, 1943; her complaint, diplopia following a head injury at the age of three years. Until two years before entry, left eye could be kept straight with effort but since then it had turned in more and more. Vision, corrected, was: R.E. 20/25; L.E. 20/50. There was an insignificant refractive error.

Examination. The eyes were normal except for 50 degrees of esotropia in the left eye. This eye could be rotated temporally within 10 degrees of the midline. Elevation and depression were unimpaired.

Procedure. Because of the marked deviation and evidence of contracture, a 3-mm. recession was performed on the left internus in conjunction with an O'Connor cinch operation on the externus and transplantations of the nasal halves of the superior and inferior recti.

Result. After two weeks the eyes were straight, diplopia appearing only on looking far to the left. After six months, the patient had binocular vision, no complaint of diplopia, and rotations of 25 degrees in each direction. Under cover, the patient had a hyperphoria of the left eye, which did not cause symptoms, for she did a great deal of reading and sewing without complaint.

CASE 3. D. K., an 11-year-old white male, was seen on July 10, 1934. He had had cross-eyes since birth. Vision with glasses was: R.E. 20/200; L.E. 20/25. Under atropine retinoscopy the following correction was indicated: R.E. +5.00D. sph. ⌯ +0.50D. cyl. ax. 90°; L.E. +2.25D. sph. ⌯ +0.75D. cyl. ax. 90°.

Examination was essentially negative except for the ocular rotations. The patient fixated with the left eye, and the right eye turned in 25 degrees. Neither eye could be rotated temporally beyond the midline. Other movements were not restricted.

Procedure. On July 14, 1934, a transplantation of the nasal halves of the right superior and inferior recti to the paralytic externus was performed. No shortening operation was done on the externus, and the internus was not touched. On March 27, 1935, a central tenotomy of the left internus was performed in conjunction with an O'Connor cinch operation of the left externus and a transplantation of the nasal two thirds of the left superior and inferior recti.

Result. Six months after surgery the right eye was 10 degrees divergent. Each eye could be rotated externally 10 degrees past the midline. A slight left hyperphoria was noted. Convergence was not impaired.

CASE 4. B. H., a 36-year-old white housewife, was seen on August 7, 1935, complaining of cross-eyes following a head injury in an auto accident two years previously. Vision, with glasses, was: R.E. and L.E. 20/20. Under homatropine retinoscopy the following correction was indicated: R.E. +2.00D. sph. ⌯ +0.25D. cyl. ax. 90°; L.E. +2.00D. sph. ⌯ +0.75D. cyl. ax. 65°.

Examination of the eyes was negative

except for position and rotations. Neither eye could be rotated temporally beyond the midline. The patient preferred to fixate with the right eye but alternated on looking laterally. There was some limitation of right infraduction.

Procedure. A complete tenotomy with stay suture allowing the left internus to recess 3 mm. was performed on August 30, 1935. On September 10th, an O'Connor cinch operation was done on the left externus together with a transplantation of the nasal two thirds of the superior and inferior recti. On November 1, 1935, a cinch and transplant were performed on the right eye, leaving the internus untouched.

Result. Binocular vision was restored in the primary position, and there was 15 degrees of external rotation in each eye. There was a slight right hyperphoria. The patient could read with comfort.

CASE 5. L. S., a 33-year-old white housewife, was seen on December 7, 1933. She complained of double vision of six months' duration. There was no history of trauma nor of intercurrent disease. Vision, uncorrected, was: R.E. 20/20; L.E. 20/15. There was an insignificant refractive error.

Examination. The patient held her head toward the right shoulder. The pupil of the left eye was larger than the right. The right eye was deviated 20 degrees nasally in the primary position and could be rotated to within five degrees of the midline. The blood Wassermann reaction was three plus, and a paretic colloidal gold curve was found on serologic examination of the spinal fluid.

Procedure. Intensive antiluetic therapy was carried out for 11 months, resulting in definite serologic improvement but no change in the status of the ocular muscles. Some contracture of the right internal rectus was recorded. On October 24, 1934, a tenotomy with stay sutures was performed on the right internus, allowing it to recess 3 mm. This produced only temporary improvement. On November 21, 1934, an O'Connor cinch operation was done on the right externus together with a transplant of the nasal halves of the superior and inferior recti.

Result. The patient complained during the first two months of a horizontal diplopia when she was tired. Internal rotation of the right eye was 35 to 40 degrees and external rotation 25 degrees.

CASE 6. L. C., a 24-year-old Indian woman, was seen on November 18, 1940; her complaint a right esotropia following a head injury resulting from an auto accident two years previously, at which time she was unconscious for three weeks. The patient seemed primarily concerned with the cosmetic appearance. Her vision, uncorrected, was: R.E. 20/70; L.E. 20/15. The right eye could be corrected to 20/20 with a plus 1.5D. sph.

Examination revealed no ptosis, but the pupil of the right eye was dilated and fixed to light and accommodation. The right eye was deviated nasally 40 degrees, and practically no external rotation was possible. A suggestive limitation of elevation and depression was noted, but this was difficult to measure in the extreme deviated position.

Procedure. Because of the patient's indecision, nothing was done until February 10, 1943, at which time a complete tenotomy with stay suture of the right internus was performed, allowing the muscle to recess 3 mm., followed by an O'Connor cinch operation of the right externus and a transplant of the nasal halves of the superior and inferior recti.

Result. Two weeks after surgery the right eye was 10 degrees divergent and it could be rotated 10 degrees externally and 15 degrees internally. The patient re-

turned to the Indian reservation and has not responded to requests for a follow-up.

Conclusions

1. Damage to the abducens nerve occurs frequently as the result of head injuries, and leads to varying degrees of paralysis of the external-rectus muscle. An increased incidence of these lesions during the war may be expected.

2. Transplantation operations offer a cosmetic and functional cure for paralyses that do not clear up spontaneously.

3. The degree of function and the degree of contracture of the opposing internus should be checked repeatedly during the early periods of the disability, while a spontaneous return of function is awaited.

4. Under ideal conditions, surgery should not be delayed while irreversible changes take place in the internus due to contracture.

5. Neglected cases present a more difficult problem and the prognosis must be more guarded. However, with proper surgical judgment, these eyes can and should be operated on. The results are often gratifying both from the cosmetic and functional standpoints.

Oakland Naval Hospital.

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NOTES, CASES, INSTRUMENTS

A DOUBLE-BLADED KNIFE FOR SCLERAL INCISIONS IN SHORTENING OF THE GLOBE

A. W. McAlester, III, Lt. Comdr. (MC), U.S.N.R., and W. E. Borley, Lt. Comdr. (MC), U.S.N.R.
Oakland, California

The purpose of this knife is threefold: it tends to make the resected scleral margins more perfect; it markedly facilitates the tedious and time-consuming procedure of making the scleral incisions in preparation for inserting the double-armed mattress sutures; and it makes possible a variation in width and type of incisions.

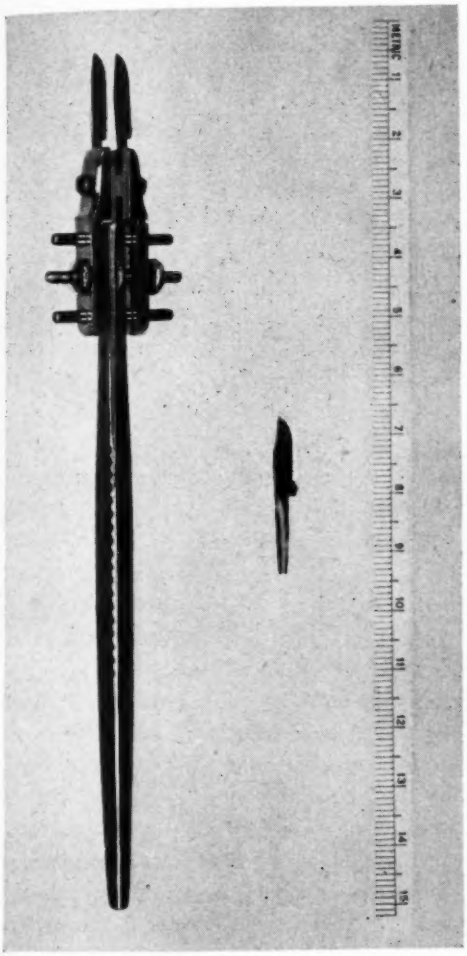

Fig. 1 (McAlester and Borley). Doublebladed knife for scleral resection.

Two number-15 Bard Parker blades from which the slots have been removed and the shanks thinned by filing are mounted into a Castroviejo knife handle of the type used in keratoplasty (see fig. 1). The blades are set to the desired width and the incisions are made into the sclera, first by one long sweeping stroke for marking then by short strokes for cutting until approximately three fourths of the thickness of the sclera is penetrated.

In this manner the making of the parallel incisions with clean-cut edges is insured. The width and type of parallel incisions can be varied with ease. Tapering of the ends can be easily accomplished by pressing the blades together at the beginning and end of the incision.

U. S. Naval Hospital.

VISION IN ANISOMETROPIA*

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It is the consensus among refractionists that, apart from strabismus, higher degrees of anisometropia are usually associated with more or less amblyopia in the more ametropic eye, especially when the eyes are hyperopic.

To substantiate this view little is found in the ophthalmic literature. Textbooks give little space to the subject and in the last 25 years there has been only one arti-

* Read before the Section on Ophthalmology, of the Wisconsin Medical Society, September 14, 1943.

cle in the current literature,[1] in which the writer gives only one case to illustrate his statements regarding the vision in higher degrees of anisometropia. Other writers discuss anisometropia in its relationship to aniseikonia and to prismatic effects in glasses, but these are not statistical reports.[2]

In order to secure data upon which an opinion might be based, 1,000 cases of normal refractions were reviewed. All cases with organic changes in either eye, either congenital or acquired, and all cases with strabismus or a history of strabismus were excluded. It is at once evident that this is an insufficient number of cases upon which absolutely accurate statistics may be based; however, certain facts are evident, and for this reason they are presented.

The spherical equivalents of all cases were determined, and upon this basis they were divided into three groups as follows (anisometropia of less than one diopter is very common and may be omitted, as little visual differences are found):

1. Anisometropia of at least one diopter and less than two diopters' difference.
2. Anisometropia of at least two diopters' and less than three diopters' difference.
3. Anisometropia of three diopters' or more difference.

In group 1 there were 24 subjects (2.4 percent)

(a) 13 (1.3 percent) were hyperopic
(b) 8 (0.8 percent) were myopic
(c) 2 (0.2 percent) had mixed anisometropia, one eye being myopic and the other hyperopic.

In group (a) the following averages were found (without exception the poorer eye refers to the more ametropic eye): average vision of the better eye was 0.9; average vision of the poorer eye was 0.6.

In this group there were seven subjects who had differences in astigmatism of more than one diopter in which: average vision of the better eye was 1.0—3; average vision of the poorer eye was 0.6—3.

In the five who had less than one diopter of cylindrical difference: average vision of the better eye was 0.9+2; average vision of the poorer eye was 0.6—3.

In analyzing this group closely, so many variations are found that it is evident that the data, while significant, cannot be accepted as the rule because of the exceptions.

This is seen by the following cases: O.D. +4.75D. sph. ⊂⊃ +2.00D. cyl. ax. 105°. Vision = 1.0—4; O.S. +3.75D. sph. ⊂⊃ +2.00D. cyl. ax. 85°. Vision = 1.0—3. Here spherical anisometropia is associated with no amblyopia.

O.D. +1.00D. sph. ⊂⊃ +1.00D. cyl. ax. 60°. Vision = 1.0—4; O.S. +2.50D. sph. ⊂⊃ +1.25D. cyl. ax. 180°. Vision = 0.6. Here 1½ diopters of spherical difference resulted in definite amblyopia.

O.D. +0.25D. sph. ⊂⊃ +1.00D. cyl. ax. 105°. Vision = 1.2; O.S. +0.50D. sph. ⊂⊃ +2.50D. cyl. ax. 75°. Vision = 1.2. Here cylindrical difference resulted in no amblyopia. This is an exception.

From this group only general conclusions can be made; namely, that in moderate anisometropia some amblyopia may be expected in the eye with the greater refraction and that cylindrical differences increase the incidence of amblyopia.

In group (b), the myopic subjects, averages were as follows: average vision of the better eye was 1.0—2; average vision of the poorer eye was 0.8—2.

Four of these subjects had cylindrical differences of less than one diopter in which: average vision of the better eye was 1.0; average vision of the poorer eye was 0.9.

Four had a cylindrical difference of more than one diopter: average vision of

the better eye was 0.9; average vision of the poorer eye was 0.6+3.

It is seen that the average differences are less in the myopic than in the hyperopic, and that in the myopic there is more amblyopia when the cylindrical difference is greater.

In group (c) there were two cases and the vision was normal in all four eyes.

In the second division there were 10 subjects (1 percent) of whom 6 were hyperopic and 4 myopic.

Of the hyperopic: average vision of the better eye was 1.0+1; average vision of the poorer eye was 0.4.

In none of these was the vision the same in each eye, the nearest being: O.D. +2.00D. sph. ⊂⊃ +0.25D. cyl. ax. 170°. Vision = 0.6; O.S. +0.25D. cyl. ax. 10°. Vision = 1.2. In this case the astigmatism is the same in each eye.

The greatest difference was: O.D. +0.75D. sph. ⊂⊃ +0.25D. cyl. ax. 100°. Vision =1.2; O.S. +1.50D. sph. ⊂⊃ +4.00D. cyl. ax. 110°. Vision = 0.1. In this case there is a great difference in astigmatism.

Basing an opinion on these cases, it is safe to say that in the hyperopic anisometropia of two diopters or more is always accompanied with a definite degree of amblyopia in the eye having the higher correction.

Of the myopic subjects in this division: average vision of the better eye was 0.8+2; average vision of the poorer eye was 0.8−3.

The greatest difference of astigmatism in these was 0.75 diopters, and in this case the vision was the same in each eye.

This is a very small number of cases; however, in them the average vision in the eye with the higher correction was slightly less than that in the fellow eye.

There were 10 subjects in the third division, 5 of them being hyperopic and 5 myopic.

In the hyperopic: average vision of the better eye was 1.0; average vision of the poorer eye was 0.4−1.

In none of these was there a difference of astigmatism of more than one diopter. The average vision of the poorer eye in this group was brought up by one subject: O.D. +4.50D. sph. ⊂⊃ +0.75D. cyl. ax. 165°. Vision = 1.0; O.S. +0.50D. sph. ⊂⊃ +0.12D. cyl. ax. 60°. Vision = 1.2.

It is significant that in this case glasses had been worn since early childhood. Omitting this case, the average vision of the poorer eye was 0.2.

In the myopic: average vision of the better eye was 0.8−3; average vision of the poorer eye was 0.4−2.

Here there is less difference than in the hyperopic; however, there is amblyopia in all cases in the eye with the greater refraction.

Conclusions

From these cases, the following conclusions may be drawn:

1. Anisometropia results in amblyopia in the eye with the greater error of refraction, and this amblyopia is more or less in direct proportion to the difference in refraction in the two eyes.

2. Amblyopia accompanying anisometropia is greater in hyperopic than in myopic eyes.

3. In hyperopic subjects, if the difference in refraction is two diopters or more, it is unusual to find equally good visual acuity in both eyes.

4. In either hyperopic or myopic eyes, if one eye is much more astigmatic than the other, there is greater probability of amblyopia.

The simplest explanation for this condition seems to be that given by McMullen,[1] "The retina of the more ametropic eye has never received such clearly defined images as its fellow." Therefore,

the development of visual acuity does not progress so completely as in the eye with the lesser refractive error.

In high myopia, another factor must be taken into account; namely that retinal changes which accompany this condition may be the cause of the diminished vision and earlier in life these eyes may have had as good vision as their fellows.

I wish to emphasize the fact that exceptions to all rules were found; however, I believe that this series of cases is large enough to be used as some basis of fact for the opinions generally held by refractionists.

Marshfield Clinic.

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EFFICACY OF VASODILATORS IN FUNDUS DISEASE

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In the last few years a number of enthusiastic reports have appeared in the literature, particularly those of W. F. Duggan and Frederick Cordes, concerning the treatment of various acute fundus diseases by means of vasodilator drugs. In an attempt to evaluate the efficacy of such treatment, 60-odd cases of the following diseases were placed on sodium nitrite—1½ grains injected intravenously—twice a week for one year. These cases were checked twice a week as to visual acuity and from time to time by Dr. Ascher and Dr. Vail as to progression or decrease in ocular pathology. Some results in the acute cases were expected, but few, if any, results in chronic cases. The cases studied comprised early and late luetic optic atrophy; acute chorioretinitis, etiology of which was determined to be tubercular, toxoplasmic, and, in a few cases, focal in origin; acute retrobulbar neuritis; optic neuritis; and alcohol amblyopia. At the end of the year a complete report of the visual acuity, ocular pathology, and results of treatment was made before the Cincinnati Ophthalmological Society, showing that there was not one case of improvement in the entire list, as regards either increase in visual acuity or decrease in ocular pathology.

These cases were picked at random and no effort was made to separate the acute cases from the chronic. I am therefore rather skeptical of the value of such treatment in ocular pathology.

215 Bell Building.

INCREASING THE ACTION OF A PARETIC INFERIOR-OBLIQUE MUSCLE BY MEANS OF THE O'CONNER CINCH SHORTENING

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San Francisco

Within the past year, excellent articles have appeared in this Journal by James White and Conrad Berens, describing in detail the technique of advancement and resection of this muscle; several years ago John Wheeler advocated a method of tucking or recessing it at its origin. Up to that time, as far as I can learn, sur-

gery of this muscle had been limited to myotomy or myectomy near its origin in order to weaken its action.

It occurred to me that the O'Conner operation, as practiced widely on the Pacific coast, offered the same advantages of safety, flexibility, and ease of performance as for other muscles. I asked Dr. O'Conner if he had ever used it on an inferior oblique, and he replied that he had never heard of its being done, but saw no reason why it should not be. I decided therefore to try it in the following case.

K. W. a boy, aged five years, appeared to have a paresis of all the muscles supplied by the third nerve of the left eye; namely, ptosis, external deviation of the left eye, head rotation, and tilt. Symptoms were recognized at the age of six months. The eye could not be brought to the midline. It could be elevated slightly, in its primary position; not at all, in adduction; and there was a marked upshoot of the right superior rectus when adduction and elevation were attempted.

My first operation consisted of transplanting the two nasal halves of the superior and inferior recti muscles into the stump of the internus, which was well resected, and the externus was receded. This abolished the head rotation and gave the patient a negative cover test, made the eyes appear straight in the primary position and allowed an adduction of 15 prism degrees.

There still was no elevation, in adduction. After two months the inferior oblique was exposed at its insertion, as described by White and Berens, the tendon was split into three, and eight strands of medium dermal were used as the cable, which was carried downward past the temporal limbus and buried under the conjunctiva, emerging in the lower fornix.

The patient was seen by Dr. O'Conner and another colleague, who agreed that the shortening had resulted in the restoration of about 50 percent of the normal function of the muscle.

This report is made to offer a variation in surgical procedure. The same advantages are found, when applied to this muscle, as obtain when it is used for other muscles.

490 Post Street.

NERVE BRANCH AT SUPERIOR ORBITAL FISSURE CONNECTING SIXTH CRANIAL WITH COMPONENT OF SPHENOPALATINE GANGLION

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New York 29

As the sixth cranial nerve enters the orbital area, a branch descends from it to join either the nerve of the pterygoid canal or the margin of Meckel's ganglion. This communicating (association) nerve at times is quite strong, at times is frail. The size (in same head) varies greatly on right and left sides, occasionally is large on both sides. At times, I have failed to expose it on one or both sides.

The branch is mentioned in a footnote by Holden (Manual, ed. 4, London, 1897, p. 220). It is so frequently found in my dissections, as to render a note advisable. The sixth cranial nerve communicates with the ophthalmic nerve (its lacrimal part?) while within the cavernous sinus. Such arrangement favors a path from the ninth cranial and the seventh, in the question of the parasympathetic supply of the lacrimal gland.

We are told, also, that the lacrimal nerve may be absent (Piersol, p. 1234) and the fourth cranial nerve may send a supply to the lacrimal nerve. The trochlear (fourth) nerve is a variable nerve, among others, and communicates with the frontal

nerve at apex of the orbit (Piersol, pp. 1230, 1234). It is interesting in relation to the rare (human) lacrimal glandular tissue at the medial area of the orbit (Harderian?). Evidently to the Harderian gland a parasympathetic and a sympathetic nerve supply is present. Man (and the whale) default as to the usual occurrence of this medial gland. But the fourth cranial nerve communicates occasionally with the frontal, supratrochlear, infratrochlear, nasociliary, and lacrimal.

The otic ganglion appears to be in the course of the parasympathetics to the parotid. The otic ganglion communicates with the vidian nerve (nerve of pterygoid canal) and thence to the sixth nerve and to the lacrimal nerve via the branch here noted.

Since the lacrimal gland resembles the general structure of the salivary gland, it would be expected to have some connection with the otic ganglion. Apparently the sixth cranial nerve affords an association link.

20 East One-hundred-sixth Street.

SOCIETY PROCEEDINGS

EDITED BY DR. DONALD J. LYLE

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

January 4, 1943

DR. ISADORE GIVNER, *presiding*

CYLINDER RETINOSCOPY

DR. JOSEPH PASCAL discussed this subject during the instructional hour.

ANISEIKONIA

DR. ARTHUR LINKSZ commented on this subject and presented a moving picture.

INFLUENCE OF COLOR ON MUSCLE TONUS

DR. ERNEST METZGER said he would discuss phenomena identical with the phototropism and phototaxis of lower animals and plants. Light sensitive, motile, unicellular organisms having half the body surface exposed to light may show contraction in one direction or expansion in the other. Positive or negative phototropism depends on the intensity of the light stimulus. The photochemical effect of various monochromatic lights differ, and plants and animals react differently in red, green, or violet light. There is no basic difference between the light reactions of man and those of the most primitive unicellular organisms.

In animals with specialized light-perceiving organs and a symmetrical arrangement of the nervous system and organs of motion, stimulation or exclusion of half the light-preceiving area is followed by unilateral increase of muscle tonus producing changes in posture or the direction of motion similar to those following vestibular stimulation. This explains the compulsory flight of insects to light.

A diagram was presented showing the optic pathway from the visual field to the calcarine region of the opposite side, thence to the motor cortex from which the pyramidal tract descends to the contralateral muscles of the neck, trunk, and antagonistic muscles of the extremities. Equilibrium is maintained by the vestibular apparatus, which produces changes in the tonicity of antagonistically acting muscle groups. Proprioceptive stimuli produce similar effects. Acous-

tic and thermal stimulation may produce tonic reactions toward the side of the stimulus.

Dr. Metzger alternately illuminated the eyes in rabbits and found a tonic turning of the neck and vertebral column and a shifting of the weight toward the light. In man, as in other higher animals, tonus changes resulting from visual stimulation are inconspicuous and overshadowed by the other equilibrium-regulating mechanisms. Relatively slight disturbances in the tonus of antagonistic muscle groups, however, become evident in the Romberg position; that is, toes and heels together and eyes closed. With so-called tonus spectacles, which transferred illumination from one eye to the other, or from one-half the field to the other half in the same eye, there was an increase of muscle tonus on the same side of the body as the illuminated eye or visual field.

The previous experiments were performed with mixed white light. With a red filter before one eye and a green one before the other, an increase in muscle tonus was seen on the side of the green field, manifested by a tendency to sway to that side, although most subjects could not state which was the green side. With the open eyes gazing at the junction of the colors of a half-red and half-green field a similar result was obtained, but the steadying influence of fixation made it less convincing; the contrasting afterimage, however, produced a very strong tonus reaction toward the original red side. With the arms held forward, on exposure of both closed eyes to red, there was a divergence of the arms and a tendency to sway backward; green produced the opposite effect.

These examples illustrate that retinal processes, independent of vision, influence tonus equilibrium. A similar independence is shown by the tonus-increasing effect of a green light on the pupil, as contrasted with the tonus-decreasing effect of a red light of the same intensity.

Chromatic aberration in the eye results in a 2- to 3-diopter difference between the foci for red and blue. Focusing is faster and more efficient in mixed than in monochromatic light.

Finally there is a time difference in the perception of moving objects in different spectral colors. A rotating white drum with vertical black stripes in a white light seems to have a red streak before and a blue streak behind each stripe.

Clinically, these phenomena are of possible value in the diagnosis of cerebral disturbances without paresis of peripheral muscles. This may also be the basis for a new approach to the problem of synesthesias, and it is hoped to show later that the coldness of blue and green, the warmth of red and orange, and the relationships of certain sounds and colors are not psychologic, but are due to correspondence of the tonus reactions. On this conception, chromatic aberration of the eye appears significantly linked to equilibrium.

Discussion. Dr. Ignatius Sommers said the traditional teaching is that the eye, labyrinth, and sensibility (superficial and deep), maintain equilibrium and that fixation is necessary. We now recognize that light alone can influence tonus equilibrium and, clinically, unequal illumination of the closed eyes can cause normal light-tonus reactions misinterpreted as pathologic. Light-tonus reactions may inhibit or augment tonus reactions produced at any sensory sphere. Diagnostic errors may thus occur on the examination of the relation of other sense organs to the tonus equilibrium. For instance, a patient with a complete loss of his labyrinths may show a falling tendency on vestibular examination if his retinas are stimulated

unequally. Such unequal retinal illumination, if overlooked, may produce false findings, on pointing, gait, and arm-tonus reactions and on testing for ataxia. The influence of light on eye-muscle tonus is important ophthalmologically; optokinetic nystagmus depends on light, and color and spontaneous nystagmus may be influenced by light and labyrinthian tonus simultaneously.

We can assume stimuli from the retinas and labyrinths as being constantly present and influencing the tonus of the body's musculature. Light tonus becomes as important for maintaining equilibrium as the various postural and righting reflexes. Although the paths of the latter are mostly subcortical, the former is cortical, from the optosensoric to the motor cortex without reaching consciousness.

It is to be hoped that Dr. Metzger will continue his promising experiments with still finer methods and especially with pure spectral colors.

Dr. Alfred Kestenbaum pointed out that the experiments were with red and green and wondered whether the reactions would be greater with red and violet, which lie at the two ends of the spectrum. In other words, do the reactions depend on the difference in wave lengths of colors or on complementary colors?

Dr. Joseph Mandelbaum suggested the differences found for red and green were artifacts, as the tests were performed with the eyes closed and the lids acted as red filters, which would cause the red side to be brighter than the green. Therefore the tonus reactions need not be related to colors. He also said that pupillary reflexes do not differ for different colors if their brightness is equal.

Dr. Benjamin Friedman also said the lids would hold back the green light. He also said the apparent lagging of the stripes of the half of the rotating drum in the red light behind the stripes of the half in the blue light could not be interpreted as unequal muscular reactions in the eye. The eye does not move faster for one part of the drum than for another; it moves *in toto*.

Dr. Joseph Pascal showed that in addition to the possible role of chromatic aberration in accommodation another factor may be at work. The usual method of showing diverging and converging pencils of rays obscures the fact of the wave front of light. When the eye is focused for some point the light waves from a nearer object strike the retina as concave waves (concave to the retina) whereas the light waves from a farther object strike the retina as convex waves (convex to the retina). There is probably some mechanism which causes a different reaction to this difference in wave front. The concave wave fronts call for more accommodation and convex wave fronts call for less accommodation.

Dr. Metzger, in closing, said that he had been forced to perform his experiments with the complementary red and green as they were the only colors of the same brightness he could obtain. Even though the lids held back part of the green light, the tonus reactions could not be due to the differences in light intensity, as the reaction on the green side is the same as if it were the more intensely illuminated. He said that Hess showed that the pupil is larger if illuminated with red than with blue light of the same intensity. In the case of the rotating drum, blue is perceived earlier than red and the stripes seem farther forward.

Objectives of orthoptic examination and training

Dr. Arthur Linksz said that one has to consider a patient's social, familial, and psychologic background before deciding whether orthoptic training is feasible at all. In squint, orthoptics is part of the plan of rehabilitation; it does not supplant operative treatment. It is basically a teach-

ing procedure, applied to individuals with faulty sensorimotor visual habits.

The first task of an orthoptic examination is to determine a patient's mode of fixation. The next is the analysis of his binocular visual habits. This includes the determination of whether or not he is able to fuse, and how much his adaptive ability is to retain or restore fusion ("amplitudes").

One of the most conspicuous binocular visual habits in squint is suppression. This occurs normally, too, at any time when contours of opposite gradients and unequal impressiveness are presented to corresponding areas of the two retinas (Werner effect). Two suppression scotomas have to be differentiated in the binocular field, one of the macula of the squinting eye, the other of the secondary macula of this eye (that is, of that retinal area which receives the same pattern as the fovea of the fixating eye). Anomalous sensory correspondence is the habit of selecting these two areas in unitary acts of attention and fixation. Amblyopia develops as a habit when the more impressive contours always belong to the same eye.

Orthoptic training is indicated for patients who maintain binocular balance with difficulty—for example, convergence insufficiency—or who develop faulty and inferior binocular visual habits—for example, anomalous sensory correspondence. Methods to be applied depend on the patient's age, intelligence, background, and compliance with other procedures indicated in the individual case.

Discussion. Dr. Joseph Pascal said the red-glass test might be used to measure the seriousness of an imbalance. If an imbalance is found by the red-glass test, then the error may be considered as likely to cause distress. If no imbalance is found with the red-glass test but one is found with the Maddox rod, the imbalance may be considered as being within the patient's comfortable fusion range. He asked whether Dr. Linksz considers fusion a unification or replacement of images, mentioning Dr. Verhoeff's views. He also brought up the question of retinal massage and the great divergence of views as to its effectiveness in overcoming anomalous retinal correspondence, as seen on the one hand in some of the glowing reports in the literature and on the other in the recent one by Dr. Fowler of Chicago.

Dr. Linksz, in closing, said that all theories of fusion are only theories and whatever seems most satisfactory is the best. Statistics of the efficacy of orthoptic training are not particularly valuable, and a single case in which he has broken down anomalous correspondence and has developed fusion and good binocular habits is more significant than a whole series of failures.

Present-day status of corneal surgery

Dr. Ramón Castroviejo said corneal ulcers may be treated by performing a delimiting keratotomy to increase tissue resistance. If cauterization is required, fulguration is better controlled than are chemicals.

Corneal tattooing with India ink has been superseded by gold or platinum chloride. These are applied after denudation of the epithelium and superficial stroma and then neutralized with 1-percent tannic acid. Corneal transplants must be of larger than usual dimensions where large scars are present so that they may be in contact with healthy cornea.

Corneal grafts have been performed in cases of dystrophies, with good results. However, in dystrophia adiposa, the outcome is unfavorable but may be improved by first performing a superficial keratectomy and then prescribing a proper diet. In the absence of recurrence a transplantation may then be done.

Round grafts are satisfactory, are less

flexible than square ones, which also have cleaner incisions.

Corneal transplantation is not a difficult procedure to master for the usual cases. In keratoconus it is difficult to perform because the tissue is too thin to support the graft; the latter rather supports the cornea in which it is placed.

When the cornea is vascularized, a superficial keratectomy must be performed. This may be followed by keratoplasty but may in itself provide useful vision.

Slides illustrating the paper were presented. Also shown were a motion picture of keratoplasty for keratoconus and one of the correction of a vascularized cornea with symblepharon.

Discussion. Dr. R. Townley Paton said that keratoplasty is less difficult than it first appears. He has tried to simplify it by using standard-sized instruments whenever possible; for example, ordinary Stevens scissors, ground to a fine point, serve adequately in cutting a square window, and a curved pair when making a round window. He prefers the round grafts for the cosmetic result.

Dr. Paton does not agree in regard to using a single suture for holding the graft in place. Many times there is a slight overriding of one edge of the graft, and unequal pressure is desired in tying the suture. He, therefore, employs two sutures, crossing them in the middle. The importance of placing the sutures close to the edges of the incision in the cornea cannot be overemphasized.

In a successful take of a graft, the anterior chamber is usually re-formed within four days. In one case in which there was a draining fistula formed by incarceration of the iris, the anterior chamber repeatedly collapsed over a period of four months. After the incarcerated iris was freed, the anterior chamber re-formed permanently, and the graft retained partial transparency.

The ideal case for corneal graft is one in which there is a central opacity and an absence of blood vessels. In old degenerative corneal conditions, keratoplasty may be indicated, and in one such case three keratoplasties were performed, two in one eye. The patient is now able to walk about unassisted for the first time in his life. He has been under observation for a period of two years.

Though many of Dr. Paton's cases have not retained transparency of the cornea, not one was a failure in the sense that the patient was made worse by the attempt. Keratoplasty in colored people does not give as encouraging results as in whites. This has been reported in other types of eye operations in the colored races.

Dr. Olga Sitchevska discussed Filatov's work. He often used conserved cornea, kept at 2° to 5°C. for not less than two and up to six or seven days. Cadaver cornea seems to institute a reaction which aids the healing process. Filatov has performed over 1,000 transplants, for therapeutic as well as optical purposes. They have been done in cases of trachomatous pannus and tubercular, luetic, rosacea, and sclerosing keratitis with good results and greatly accelerated subsidence of the inflammation.

Dr. Castroviejo, in conclusion, said the cosmetic result is satisfactory with a square implant that is not transparent. The use of cadaver cornea is not new and much research shows it is not better than fresh cornea, but rather the reverse is true. If a graft becomes opaque it must be removed entirely when another keratoplasty is performed. He has not dared to operate on inflamed eyes and finds that the use of a spatula as a guard can do damage. In favorable eyes he obtains 80 to 85 percent transparent takes.

Leon H. Ehrlich,
Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY

January 16, 1943

DR. JAMES M. SHIELDS, *president*

PIGMENT SPOT (NEVUS) ON CORNEA

DR. WILLIAM H. CRISP presented a 12-year-old boy who had been brought in because of a supposed foreign body on the cornea near the upper limbus. The wind had blown something into the boy's eye, and, although he had experienced no difficulty after the first 24 hours, the mother had watched him for possible presence of the foreign body and had discovered the corneal spot. There was no foreign body and no loss of corneal tissue; however, just within the limbus there was a dark brown spot, level with the surrounding epithelium and having an irregular extension downward in the vertical meridian. The irregularly circular main portion of the spot had a diameter of about 0.33 mm. The eye was free from irritation.

Under the slitlamp the spot appeared to be made up of fine pigment granules, closely approximated to one another, and lying just beneath the corneal epithelium. The upper border of the pigmented area was almost reached by a fine arterial branch which terminated in a slight apparent expansion of the vessel, and from this expansion a fine venous branch could be seen receding upward but fading away into the deeper scleral tissue. The eye was normal in every other respect and the uncorrected vision was 20/16. The parents had been advised to have the condition watched from time to time to see if any change occurred in the size of the pigmented area.

Discussion. Captain George F. Gsell asked what should be done if the nevus started to increase in size.

Dr. Crisp, in answer to this query, suggested taking a specimen for laboratory examination, cauterization, and then making a conjunctival flap.

CONGENITAL CATARACT

DR. W. M. BANE presented two cases of congenital cataract. The first patient, H. S., aged four years, was one of five children, three of whom have either congenital or developmental opacities of the lenses. This patient was seen about one year ago by an eye doctor who reported that the opacity in each lens resembled the developmental form of infantile nuclear cataract, and the boy seemed to have fair vision. During the past year the parents have noticed that the vision was worse, and that the cataracts were visible to the naked eye. The lenses were completely opaque. The case was unusual in that seldom are any changes seen in these nuclear cataracts, but in this one, progression to maturity had been quite rapid. An older sister was operated on for a very similar bilateral cataract.

The second patient was E. S., a two-year-old brother of the first patient. The lens in each eye showed opacities located on the posterior surface which were thin, flat, and irregularly shaped. They represented unusually extensive persistence of the tunica vasculosa lentis. This type of opacity is rather uncommon. No remnant of a persistent hyaloid membrane was observed. In Duke-Elder's textbook it is stated that these plaques consist histologically of dense connective tissue, with oval and spindle-shaped nuclei, and are not pigmented. Since the vision was only slightly impaired no interference was contemplated.

Discussion. Dr. Fritz Nelson suggested surgery—making a keratome incision of the cornea and also penetrating the lens, immediately expressing it.

UNUSUAL PIGMENTATION OF THE FUNDI

DR. HARRY SHANKEL presented the case of G. E. M., aged 40 years, who was

first seen in December, 1937. He had had frequent headaches after close work for the past four months. The headaches were occasionally accompanied by blurring of the vision. The patient had never worn glasses.

The vision, R.E., was 20/20; L.E., 20/40+. The tension was normal to palpation. The pupils reacted to light and accommodation. The ophthalmoscopic examination of the right eye revealed no pathology. The left eye showed increased pigmentation in the lower nasal quadrant and a peculiar pigmentation about the vessels.

The refraction was R.E. +0.50D. sph. ⌯ +0.12D. cyl. ax. 80°, vision 20/15; L.E. −0.25D. sph. ⌯ +0.25D. cyl. ax. 90°, vision 20/15. The patient returned on December 22, 1942, with the complaint that his eyes burned and hurt. Results of the external examination were negative. The refraction was practically the same as found five years previously. Ophthalmoscopic examination of both eyes revealed a peripheral pigmentation, particularly about the blood vessels. The visual fields showed some contraction. The general physical examination was negative except for blood pressure of 130/99. The blood Wassermann test was negative. There was no history of night blindness.

Tuberculous choroiditis

Dr. W. T. Brinton presented the case of Z. P. B., aged 47 years, who stated that he had had an injury to his right hip in 1918. A positive diagnosis of tuberculosis of the right sacroiliac joint was made in 1924, and he had been under care for this condition ever since.

In 1933 the right eye was inflamed for one month, but there was no apparent visual disturbance. He was advised in June, 1938, while taking a driver's test, that the vision in the right eye was poor, the left normal.

In September, 1941, he noticed that the vision in the left eye was failing but obtained glasses which helped the vision. During this year he lost central vision in the right eye, following an abscess of the hip. One month ago the vision in the left eye began to fail. His glasses were changed but without improvement. Examination of the fundus showed choroidal patches in both eyes, more marked in the right. The macular region in each eye was involved. The choroidal patches presented all stages from grayish yellow areas to dark pigmented spots. A diagnosis of tuberculous choroiditis was made.

Keratoconjunctivitis

Dr. Fritz Nelson persented the case of J. J., a 26-year-old man who worked at an airplane factory as stock-room clerk. His right eye became inflamed in November, 1942. General physical examination revealed no pathology. The blood Wassermann test was negative. X-ray studies of the teeth showed nothing abnormal. The condition cleared up somewhat but only for a short time. He was seen for the first time on December 22, 1942. Examination revealed a superficial punctate keratitis, right eye, with marked injection of the entire eyeball. The iris was normal. Herpes labialis was present. There were epithelial foci located in the temporal section of the cornea. Two days later all foci were practically healed. The patient started back to work on December 26th. The eye remained quiet until December 31st, when the same condition recurred. He was given 1/10 S.E.D. X ray, unfiltered. The condition was completely healed on January 4th. In five days he suffered a recurrence, and again only in the right eye. The left eye was never affected. Smears revealed no bacteria.

The question arose whether the condition was an epidemic superficial keratoconjunctivitis (virus disease) or caused

by some chemical agents at his place of employment. Similar cases seemed to occur more frequently in Colorado during the past six months, with very frequent recurrences. Local treatment very often proved ineffective.

Discussion. Dr. R. W. Danielson asked if it might not have been similar to the condition reported in epidemic form on the coast, and, if it was, suggested the use of riboflavin.

Dr. D. H. O'Rourke said that it did not make much difference what type of medication was used, as the condition had a tendency to recur and that X-ray treatment was not advisable. He suggested the use of vitamins and 5-percent sulfathiazole ointment, or that half-strength iodine applied to the denuded surface was possibly the treatment of choice.

Leucoma of eye following injury

Dr. Joseph Tschetter presented the case of A. B., aged 52 years, who said that about one year ago he was chopping wood and a small piece hit him in the left eye. He went to a local doctor, and the piece of wood was removed. Three days later, when the eye became painful, he appeared at the Colorado General Hospital and was hospitalized.

Examination revealed a large, gray, central opacity with deep congestion and a very painful eye. The tension was normal. The pupil was adherent posteriorly and there was exudate in the anterior chamber. Vision, R.E., was 20/200, without correction; L.E. perception of hand movements. Results of the external examination of the right eye were negative. The tear ducts were in good condition.

Treatment consisted of the application of hot, moist compresses; 5-percent sulfathiazole ointment; 1 mg. riboflavin, three times a day; 1-percent atropine, locally; intravenous injections of typhoid; and multiple paracenteses. A delimiting keratotomy was performed with daily opening.

The refractive error, R.E., was −2.50D. sph. ⌯ −0.50D. cyl. ax. 85°, vision 20/20. A +2.00D. sph. was added for reading. The left eye could not be improved with lenses.

The patient left the Hospital at the end of one month. He returned to the Out-Patient Department at the end of six months, at which time examination revealed a large leucoma with straight margin and synechia. The lens could not be seen. An optical iridectomy was advised and performed. The lens was found to be cataractous; it was extracted at a second operation.

Walter A. Ohmart,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

January 18, 1943

Dr. Louis G. Hoffman, *president*

Scientific program

The treatment of lesions of the eye with beta radiation

Dr. A. D. Ruedemann (by invitation) presented a paper on this subject.

Clinical program

(Presented by the Department of Ophthalmology, Loyola University)

Closure of central retinal artery, right eye

Dr. Paul Carelli presented a 19-year-old white boy who was first seen on October 25, 1941. The vision of the right eye had suddenly become blurred a few hours earlier. There was no history of trauma. General physical examination and past history were essentially negative.

Vision, R.E. 1/200, L.E. 1.2−2 and

J1. External examination was negative. The fundus of the right eye showed pallor of the temporal portion of the disc margin extending to the macular region, about which there was intense pallor with a cherry-red spot.

He was admitted to the hospital where therapy consisted of vigorous massage of the eyeball and paracentesis of the anterior chamber. Acetylcholine, one gram, was given daily. Pilocarpine sweats and vasodilating drugs by mouth were administered. After 15 days' hospitalization he was seen daily at the office, and was given nine injections of nitroscleran, 1 c.c. intravenously.

At this time vision in the right eye was sufficient only to count fingers at 2 feet.

CLOSURE OF CENTRAL RETINAL ARTERY, LEFT EYE

DR. PAUL CARELLI said that this man, aged 27 years, gave a history of sudden loss of vision on June 17, 1942. He went to a clinic where he received an injection into his arm. Three days later he reported for examination.

Vision, R.E. 1.2−1 and J1, L.E. nil. The left eye was externally negative. The pupil was slightly dilated and reacted sluggishly to light. Fundus examination showed that the disc margins were blurred, the blurring extending from the temporal region outward slightly beyond the macular area. The entire macular region was pale, with a small red spot in the center. The remainder of the fundus was apparently normal.

All laboratory and physical findings were negative. The patient received biweekly injections of 1 c.c. nitroscleran and 1 c.c. thiamine, eight injections in all, with large doses of vitamin-B complex. About four months after onset there developed secondary atrophic changes of the disc of the left eye with dark-brown pigmented areas about the macula. There was no improvement in vision.

Robert Von der Heydt.

SAINT LOUIS OPHTHALMIC SOCIETY

January 22, 1943

DR. CARL BEISBARTH, *president*

CATARACT EXTRACTION WITH THE USE OF NEW SUCTION APPARATUS

DR. WILLIAM E. SHAHAN described his clinical experiences in cataract extractions, substituting metal mask and collodion dressings for the ring mask. He discussed the need of taking cultures preoperatively and the value of a definite time interval after the use of cocaine and adrenalin for local anesthesia. He exhibited an apparatus which he had used experimentally for the extraction of lenses through hypodermic needles connected with a vacuum and a rotating drill.

Discussion. Dr. F. O. Schwartz described an experience he had had with atropine and cocaine in oil. Following a cataract operation Dr. Schwartz had had the atropine and cocaine in oil delivered to the patient's bedside. Four hours later the patient was found sitting up in bed, completely out of his mind. He had received the full bottle of atropine and cocaine representing 1 gr. of atropine and 2 gr. of cocaine. Hyperemesis and catharsis were induced. Enemas were given and 20 hours later the patient was completely normal.

Dr. B. Y. Alvis asked why the patient would be unable to close his lids after cocaine and adrenalin had been injected subconjunctivally, and also, if Dr. Shahan paid any attention to what type of growth was found in the cultures. He said that Dr. Julianelle, after examining the cultures, had reported on whether they were Staphylococcus albus or aureus, and if

they were mannite fermenting or not. Some other organisms were identified but the main attention was paid to those known as Staphylococcus aureus. No organisms were considered by him to be innocuous but that many a patient having a mild culture of Staphylococcus aureus had been operated on, apparently without results.

Dr. M. Hayward Post said that it would be well, before following this practice, to consider the toxicity of cocaine. He believed that the exact strength of the solution used should be known and the amount given accurately determined. It is well recognized that as people grow older their tolerance to cocaine becomes greater. Conversely, in young people it might be dangerous to inject this drug four times, unless the amount of each injection were small, because of the absorption of cocaine into the system.

Dr. Shahan, in closing, answered that the injection is made as far as is possible into the cul-de-sac and that there must be some permeation into the orbicularis fibers. With regard to the cultures Dr. Shahan replied that he did not care what organism was found. If any growth at all was found he would be concerned.

Dr. Shahan said that he used this solution quite freely in people of all ages, even in children. He thought that the toxicity of the cocaine was controlled by the use of adrenalin with it. He used a solution of 5-percent cocaine in adrenalin 1:4,000. The adrenalin prevents the rapid diffusion of the cocaine into the system. Except for an occasional temporary collapse he had never had any bad effects from its use.

Pentothal sodium anesthesia in ophthalmology

Dr. Lawrence T. Post and Dr. E. Norris Robertson presented a paper on this subject which was published in this Journal (November, 1943).

Discussion. Dr. T. E. Sanders said that he had been on the ward service with Dr. Robertson in October, 1942, when the use of pentothal sodium on ward patients had been started. He stressed the value of using some local anesthesia with the pentothal sodium in many types of patients.

Dr. L. T. Post said that pentothal sodium anesthesia had been highly recommended to him at the Academy meeting last fall. His experiences with his private patients were limited, but the reaction of those who had received the drug was very favorable. This included some patients who had had previous operations under other anesthesia. The only change made in the procedure was to put in a stay suture through the superior-rectus tendon to keep the eye under control during the operation. In 344 patients at Barnes Hospital there have been no deaths from the anesthetic. One would think it as safe as any general anesthetic could be if good judgment were used in employing the drugs. The question of vomiting concerns us considerably. The incidence was too high to make one want to risk every case of cataract with it. The preliminary drugs used and the postoperative diet given might be of considerable importance in causing vomiting. Only one of the several patients on whom he had operated vomited and she had received hyoscine. In general, he thought that pentothal-sodium anesthesia was a godsend for the high-strung nervous patient.

Dr. B. Y. Alvis said that he may have been the first here to have used the intravenous anesthesia. Over two years ago he had used it and it had worked out very satisfactorily in a cataract case in which there was considerable prolapse of the iris. His experience was so favorable with that case that he has used this form of anesthesia intermittently in the Jewish Hospital since that time. In his small series of cases none of the patients had vomited except those who had had preoperative narcotics. He felt that this was

responsible for the vomiting in most cases. By using local anesthesia in addition to the pentothal sodium one can help prevent the patient's moving suddenly. He has had several patients who sneezed violently during the induction. He believes that this has now been controlled by using a slower induction. He reported one patient who had had his first eye operated on for cataract under pentothal sodium and had been very disappointed when the second eye had been operated on under local anesthesia alone.

Dr. William H. Meinberg said that it had been used for several months on eye patients at Homer Phillips Hospital (for Negroes). He had had some trouble on account of vomiting and because the patient came out from the anesthetic during the operation. This was especially so in young robust patients.

Dr. M. Hayward Post inquired about the use of pentothal sodium at various ages, and asked if it was safe to combine it with other general anesthetics.

Dr. F. O. Schwartz described an enucleation in which pentothal sodium anesthesia had been used with very favorable results.

Dr. Robertson, in closing, said that on the advice of the anesthetists pentothal sodium had not been given to children. In general, pentothal sodium can be combined with other general anesthetics. Young healthy patients seem to react more satisfactorily than those who were not so robust, although in this series there had been no one under 20 years of age.

Retained intraocular foreign body

Dr. L. V. Gorilla described a patient whose eye had been penetrated by a foreign body while he was chiseling on a door. When he was examined, one week later, a small dark foreign body was observed near the back of the eye about two disc diameters temporal to the macula. The foreign body could be seen to move when a magnet was applied in the neighborhood of the eye. The course of the foreign body through the cornea, the iris, and the vitreous could be traced. Operation was refused. Normal vision was retained for eight months. Then a mild choroidal and retinal reaction developed which reduced visual acuity to 20/25. This has persisted to the present time or for more than a year without further reaction or loss in vision.

Discussion. Dr. Adolph Lange said that the lack of reaction to the foreign body was particularly striking and perhaps unfortunate; that although the eye had been perfectly clear for so long the retinal and choroidal reaction might continue and eventually cause loss of vision.

Dr. William E. Shahan described several cases of intraocular foreign body which had come under his observation—in one case penetration by a piece of copper. Four years later the eye became discolored and inflamed, and had to be removed.

Dr. John Green described a case in which a patient's only eye contained a piece of copper in the vitreous. An inflammation of the eye that developed three years after the injury quieted down eventually following the administration of large doses of potassium iodide. Glaucoma developed later but was controlled by operation and miotics, and the eye has continued to retain some vision.

Dr. William M. James described a case in which an eye had retained a sliver of glass in the iris for three or four years without any loss in vision or sign of irritation.

Dr. H. R. Hildreth said that one of his patients had had a tiny piece of glass in the iris of one eye. This eye remained chronically inflamed until the piece of glass was removed. It then became quiet and has remained so for about three years.

James Bryan,
Editor.

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ADEQUATE MEDICAL CARE

Some may feel that the columns of a journal devoted to a medical specialty are hardly the place to discuss proposals for socialized medicine. But the practitioners of a specialty are surely not less concerned in such proposals than the general physician.

The successful specialist may be disposed to think that his private practice will not be affected by socialization to the same extent as that of the general practitioner. This, however, is hardly true.

The practice of ophthalmology is conducted not merely in the private office of the ophthalmic surgeon, but in the public clinic, in the "charity" or community hospital, and last, but not least, in the store or office of the optician or optometrist. The social and economic interrelationships of all these fields of activity are matters of concern to every ophthalmologist.

It can hardly be said that free discussion of proposals for socialized extension of medical care has been encouraged in national medical periodicals. In private gatherings of physicians we hear various opinions, although we may be conscious

at times of a sort of fear, on the part of the less outspoken and less independent thinkers, that they will lose caste among their professional brethren if they venture to express themselves in conflict with the general current of opinion. On the other hand, there is perhaps a disposition to authoritative overassertion on the part of those who condemn utterly, instead of discussing patiently, legislative proposals for national or state medical care.

In spite of the conclusions of the Committee on the Costs of Medical Care, 1932; the findings of the two-volume study entitled "American medicine: Expert testimony out of court," 1937; the report of the California Medical Economic Survey, 1938; and the report of the National Health Conference, 1938; as well as recent startling data concerning the health and medical care of draftees, we encounter sweeping statements as to the approximate perfection of our present system of medical care and its alleged superiority to anything which the world has yet produced or to anything that might develop out of a controlled national system.

Butler (Department of Pediatrics, Harvard Medical School), in an article published by "State Government," organ of the Council of State Governments, March, 1944, makes the general accusation that the societies representing organized medicine fail to permit expression of a minority opinion. This is in part due to the peculiar practice of considering a majority opinion as the unanimous opinion. (Incidentally, the writer of the present comment has always regarded as unwholesome and misleading the tendency of organizations to resolve that the majority opinion is the unanimous opinion.)

Garceau, in his book entitled "The political life of the American Medical Association," explains how this result is accomplished without open violation of democratic principles. Butler declares that, in consequence of this restriction of minority opinion, and the incidental inhibition of deliberate discussion and progressive thought, "organized medicine is notoriously reactionary."

This disconcerting conclusion is supported by citation of a series of incidents in the recent history of organized medicine in this country. Although Blue Cross hospital insurance is now referred to as indicating the readiness of the medical profession to support measures which will render national health insurance unnecessary, we are reminded that as late as 1934 the American Medical Association opposed this form of voluntary insurance.

In that same year, a plan by the American College of Surgeons for prepayment of medical care at approved hospitals was condemned by the Judicial Council of the American Medical Association.

In 1934, two California physicians who operated a group prepayment medical service were expelled from the Los Angeles County Medical Association and from the medical association of their state. The Judicial Council of the American Medical Association subsequently reported that these two physicians had not had a fair trial.

In 1938, the Journal of the American Medical Association, in discussing California's medical problems, mentioned that "continuous efforts to induce county medical societies to organize prepayment medical service groups" had so far been "successfully discouraged."

In any informal gathering of physicians, it is common experience to hear trade unions condemned for their extreme practices, including suppression of minority opinion. Yet a tendency toward

a sort of trade-union autocracy, with suppression of individual opinion in matters of professional ethics and economics, is rather common among medical organizations. An example of this attitude was the attempt made a few years ago, by the council of one of the largest state medical societies, to provide that "component county medical societies, their officers, committee-men, and members shall not initiate any policy, propose any legislation, or participate in any activities that are contrary to the policies of the Medical Society of the State. . . ."

The proposal was defeated, but we wonder what the Supreme Court of the United States might have said, if this proposal had been adopted, as to its bearing upon the "accepted laws of free enterprise." (See the Court's decision in regard to the A.M.A. and the Group Health Association of Washington, D.C.)

Butler raises the question whether organized medicine is more interested "in perpetuating a time-honored system of medical practice than in providing better and more economical medical care."

Within the profession there is certainly an important body of minority opinion which does not regard the present system, or lack of system, as providing the most perfect possible form of medical care. The section of the community which is least adequately covered by the present situation, even with the aid of the voluntary prepayment schemes, is the so-called "intermediate low-income group." Moreover, there are certain objections, on the score of efficiency and economy, to insurance systems in which individual fees-for-service are established by the physician in his direct relationship with the patient. There is considerable room for doubt whether such voluntary insurance will solve the problem of the relative inadequacy of medical care among certain sections of the community.

Discussion of the most frank and personal character is necessary and advisable. We must remember that, in the broad view, a physician is not a private enterprise, seeking only his own self-interest, but a servant of the community, and that his professional life must ultimately be organized along lines which will best satisfy the community needs rather than the desires and ambitions of the individual practitioner.

A dogmatic objection to anything that smacks of compulsion (even though it includes many voluntary features) will not serve to defeat legislative proposals for socialized medicine. The element of compulsion already exists in regard to many actions which by courtesy we call voluntary. An excellent example, as Butler points out, is the ubiquitous Community Chest, to which important groups of the community are practically forced to contribute. We are hardly disposed to regard as entirely objectionable the national income-tax law, with its extreme features of compulsion. Social Security has come to stay. Education is a form of compulsion. The fact is that democracies can only live and prosper by innumerable compulsions based upon the will of the people and of their elected representatives. The extent to which compulsion is applied depends in the last resort upon the popular judgment and the popular will.

Rightly or wrongly, most physicians are apparently disposed to regard the Wagner-Murray-Dingell Bill, particularly in its medical provisions, as an extreme measure. But many physicians, without more than the most superficial knowledge or understanding of this lengthy and complicated legislative proposal, themselves indulge in extreme forms of criticism and condemnation. In

the long run, an unwillingness to tolerate open discussion of detail as well as principle would bring us neither credit nor advantage. W. H. Crisp.

AGENCY-DISPENSING PRACTICES

Allegedly with the idea of eliminating or at least reducing subterfuge, and after discussion with many persons, and possibly also in order to comply with Government regulations without embarrassment to refractionists, and probably to induce refractionists to send their prescriptions to them to be filled, certain companies have adopted a policy which they call agency dispensing. This consists in a written agreement between the licensed refractionist and the optical company by the terms of which the refractionist appoints the company as his agent for the dispensing of eye glasses to the refractionist's patient and authorizes the company to collect from the patient for the refractionist a sum designated by him in payment for the merchandise. The company credits the account of the refractionist with the money paid by the patient and sends any balance in this account at the end of each month to the refractionist or to any individual or organization designated by the refractionist. The refractionist indicates to the dispenser the method of collection to be employed in the individual case, whether the transaction is to be on a cash or a credit basis. The risk of credit is assumed by the refractionist. All material and service charges are immediately charged to the refractionist's account for whom the agent acts. The agent credits the account of the refractionist with any money collected from the patient and the resulting credit balance, if any, is sent to the refractionist at the end of each month. The dispenser assumes the task of the interim care of the adjusting of the patient's glasses at no further cost to the patient. If, however, the refractionist desires to make a change in the prescription for which he thinks the patient should not pay additionally—for example, if the refractionist makes a change in the lenses within a few weeks after the original prescription because the patient is not comfortable with the new lenses—the cost of such replacements is charged to the refractionist's account.

A notice is displayed in the office of the dispenser that is worded as follows: "Glasses are dispensed only on Rx of and as agent for licensed refractionists." A receipt is given to the patient which states that, ". . . dollars, have been received for the account of Dr. . . ."

This agency-dispensing policy has been discussed previously in the Journal, but since it is a matter of extreme importance to ophthalmologists, some reiteration and enlargement of the scope of the discussion seems warranted. It is obvious that there are many cities in the United States which do not now have dispensing opticians who perform no refractions themselves. The Guild of Prescriptions Opticians, whose code precludes the refracting of patients by its members, has an enrollment of approximately 225 firms. The problem of how ophthalmologists who do not live in communities in which nonrefracting opticians are located shall handle their prescriptions for glasses has always been one extremely difficult of solution. The method of purchasing supplies from the lens wholesaler and himself assuming the task of fitting the frames, making the constant adjustments, and undertaking the financial responsibility for the commercial element in the transaction has been one that has been distasteful to numerous ophthalmologists. Many of these have welcomed the agency-dispensing plan as being a simple

solution to their difficulties in that it provides excellent service to the patient at no cost above that of the average dispensing optician, and it can scarcely be doubted that it has been employed by many ophthalmologists as a means of additional remuneration for the ocular care of the patient.

It is the contention of the writer that any practice that gives a hidden fee to the physician, whether it be through the dispensing of glasses, orthopedic appliances, hearing devices, or drugs, the referring of patients to unscrupulous morticians or shyster lawyers for a monetary consideration, is unethical. This, however, is an entirely negative approach to the subject. The young ophthalmologist must have positive guidance. It, therefore, devolves upon those who formulate policies for organized medicine to advise young men placed under a variety of circumstances and conditions how they should proceed. The question arises whether it is possible for the agency-dispensing policy to be so conducted as to be acceptable to those who abide strictly by the provisions of the policy currently in effect in the American Medical Association, or not. It would seem that this could be done if the opticians engaging in this practice would take the stand that they would not return to the doctor any balance that might accrue in the doctor's account, but would utilize it to reduce the general cost of glasses to the public. Or, if this policy would meet with too much opposition from non-refracting opticians and optometrists for it to be tenable, as seems not unlikely because it would inevitably lead to a general reduction in the retail price of glasses, it could still be agreed between refractionists and dispensers and openly proclaimed to patients that any monies accumulating to the credit of the individual doctor would not be given to this doctor, but would be paid to any recognized charity or educational organization designated by the doctor. This would remove the onus of improper action from the doctor, but would not help in the fundamental problem of decreasing the cost of glasses to the patient and probably would not be very satisfying to the patient, who would consider that any excess profit should be removed from the transaction.

If it can be shown that those utilizing the agency-dispensing policy charge less than those who do not use it because of the credit that the agency gives them, this would be a good talking point for those advocating the plan; but evidence of this is practically impossible to obtain.

It seems to the writer that the ophthalmologist who practices in a city where no optical service is available which merely fills the prescriptions without entering into any financial agreement with the refractionist would be acting as ethically as possible if he added a clause to his contract with the agency-dispensing organization in which it is stated that it has been agreed that he would not personally participate in any profit from the sale of glasses, but that any such profit accruing to his credit would be contributed at his designation to some recognized charitable or educational institution. This would keep the eye physician's relationship with his patient on the high plane on which it belongs and retain the confidence of the public in the integrity of the doctor. By implication it might be argued that his having any type of contract with an agency-dispensing company implied a tacit agreement with the underlying policy of that company. However, if he has no alternative but to utilize these companies, his action would certainly be considered the best possible one under the circumstances and therefore above criticism.

If these suggestions should prove as

unpopular as the writer imagines they will, the least that dispensers and refractionists should do would be to inform the patient in unequivocal language that the refractionist was receiving a remuneration of unspecified amount in addition to the fee paid by the patient directly to him. As the matter now stands, it seems that the signs in the optician's office and the receipts given to the patients are too ambiguous to convey this information to many of those who are the unsuspecting third parties in these transactions. With tongue in cheek the writer would suggest substituting the word "prescription" for the technical "Rx" and adding a phrase so that the notice in the agency office shall read: "Glasses are dispensed only on prescription of and as agent for licensed refractionists who may participate in any profit that might accrue from this transaction."

Lawrence T. Post.

BOOK NOTICE

INDUSTRIAL OPHTHALMOLOGY. By Hedwig S. Kuhn, M.D. Clothbound, 294 pages, 114 text illustrations including two color plates. St. Louis, C. V. Mosby Co., 1944. Price $6.50.

This excellent book will be of unusual interest to all who practice industrial ophthalmology and truly an eye opener to those not engaged directly in this type of work. The importance of complete familiarity on the part of the ophthalmologist with the problems of industries and his actual occasional presence in the plants, to the employees of which he gives service, is brought home strikingly to the reader. Most ophthalmologists probably never visit industrial plants with a view to helping solve the eye problems connected with them, but merely perform refractions, when the employees are sent from the factories, and take care of injuries, and occasionally represent the company or the individual in court.

The possibility of being of service in the plants and to the workers therein by instituting good lighting, advocating the use of protective goggles especially adapted for the work for which they are to be used, and the prescribing of spectacle lenses arranged for the proper working distances of the individual are subjects carefully considered by the author. The material used in preliminary examination, the need of special test objects such as those for stereopsis, color, and others for particular types of work, are outlined. Considerable space is given to the evaluation of visual defects in the production of accidents. The reader will be convinced that his expert advice, provided he has educated himself properly to give such advice, will be of great importance to the plant in increasing production and saving lost hours from ineffective work due to poor vision and in the prevention of accidents.

An excellent chapter on industrial injuries from solid bodies has been written by Dr. Albert C. Snell. Prophylaxis and treatment are included. Many seemingly trivial but undoubtedly important points are brought out in the chapter on eye protection. Attention is called to such matters as the care of goggles and the importance of having clean paper or antifogging solution readily available. Another point is the value of the constant attendance in large plants of an optician with an instrument carriage that can be moved from worker to worker for the adjustment of the spectacles, for the repair of breaks, and in general for servicing spectacles.

Considerable discussion is given to welding, also to actinic or flash conjunctivitis and epidemic keratoconjunctivitis.

In the appendix are discussed toxic

hazards, and there is a glossary of terms. A program for industry is outlined and, finally, the appraisal of loss of visual efficiency as approved by the Section of Ophthalmology of the American Medical Association in 1940 is added. There is a good index and the book is well illustrated throughout. Lawrence T. Post.

CORRESPONDENCE

Recession of the inferior oblique

April 22, 1944

Editor,
American Journal of Ophthalmology:

The article by Dr. George P. Guibor entitled, "Recession of the inferior-oblique muscle from the external-rectus approach," in the March, 1944, number of the American Journal of Ophthalmology, would seem to call for some comment.

No exception is taken to the advisability of the operation or the results obtained, but the technique described is unnecessarily cumbersome and complicated and has no advantage over the technique described and illustrated by Dr. James W. White in the American Journal of Ophthalmology (1943, v. 26, pp. 586-591). From reading Dr. Guibor's article one might easily draw the conclusion that to recede the inferior oblique at or near its insertion one must divide and reflect the lateral rectus. This is by no means the case. Recession of the inferior oblique can be done without disturbing the lateral rectus, except to retract it gently upward, and, for the best results, I believe it should be done without disturbing the inferior rectus. There is no advantage in having the inferior oblique and the inferior rectus matted together by scar tissue. If the conjunctival incision is made in the manner described by Dr. White, there is no excuse for cutting the inferior rectus by mistake, although Dr. White recently stated that he had seen four cases where the inferior rectus had been cut when the operator believed he had been tenotomizing the inferior oblique, and men who work with him had seen four other similar cases. I have seen one such case recently. To repair such a mistake is a life-sized job and I doubt if it can be done perfectly, particularly after the contractures which result are well established.

Dr. Guibor may intend to discuss the advancement or shortening of the inferior oblique in a subsequent article but attention should be called to the fact that the inferior oblique can be successfully shortened through the same approach, as pointed out by Dr. White (Trans. Sect. Ophth. A.M.A., 1941, p. 308, and again in Trans. Pac. Coast Oto-Ophth. Soc., 1941, p. 112, "A review of twenty-seven years with the obliques"). Dr. Robert Irvine, of San Francisco, told me recently that he had been able to shorten the inferior oblique at its insertion by O'Connor's method. [Ed. Note: see page 644 of this issue.]

The student who is interested in the *indications* for surgery on the obliques would do well to read Dr. White's paper entitled, "Indications for treatment for combined lateral and vertical strabismus" (Arch. of Ophth., 1933, v. 10, Nov., pp. 585-592).

One feature of the inferior-oblique muscle which has perhaps not been sufficiently stressed is its peculiar innervation. On theoretic grounds, it would seem wise to work "at or near" the insertion or else at the origin, as recommended by Wheeler ("Advancement of the superior oblique and inferior oblique ocular muscles." Amer. Jour. Ophth., 1935, v. 18, Jan., p. 1). No case has to my knowledge been reported where shortening of the inferior oblique has resulted in complete

paralysis of this muscle, but it is something to keep in mind if one is tempted to operate in the neighborhood of the belly of the muscles or to dig too deep in the floor of the orbit.

It will occur to everyone that a good time to practice picking up the obliques at their insertion (if the eye is not too inflamed) is when obliged to do an enucleation. To pick up the obliques at their insertions and sever them there actually facilitates an enucleation and it gives some experience that is valuable when one contemplates either a recession or an advancement of the inferior oblique or an advancement of the superior oblique at their insertions.

(Signed) George N. Hosford, M.D.
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ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1
GENERAL METHODS OF DIAGNOSIS

Allen, Lee. **A new contact lens for viewing the angle of the anterior chamber of the eye.** Science, 1944, v. 99, March 3, p. 186.

A plastic contact lens of entirely new design, for use in gonioscopy, is described by the author. This new lens has a concave surface which lies apposed to the cornea, from which it is separated only by a thin film of tears. At the sides are (1) a convex refracting surface which permits direct visualization of the chamber angle, and (2) a plane reflecting surface which utilizes total internal reflection so as to permit examination of the angle by looking through the flat top of the plastic block. An easily flexible wire spring holds the lens in place without injury to the cornea. Benjamin Milder.

Cherif, M. de R. **Ocular biomicrophotography.** Anales de la Soc. Mexicana de Oft. etc., 1942, v. 17, Sept.-Oct., pp. 167-174.

The author describes an apparatus for slitlamp photography which he has found satisfactory. This is an adaptation of the ocular of the microscope and a cardboard box making a dark chamber. Focusing is done by sliding two cardboard tubes one within the other.

For details one should consult the original. (6 figures.) Eugene M. Blake.

Harris, R. H. **Comparison of the Ishihara and the American Optical Company series of pseudoisochromatic plates.** Arch. of Ophth., 1944, v. 21, Feb., pp. 163-164. (See Section 3, Physiologic optics, refraction, and color vision.)

Koch, F. L. P. **A color filter for retinal photography.** Amer. Jour. Ophth., 1944, v. 27, March, pp. 281-282.

Koch, F. L. P., and Williams, A. F. **A modified film adapter for retinal photography.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 403-407. (4 illustrations, references.)

Livingston, P. C. **The form and character of rod scotometry.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 349-353. (One figure, 5 fields.)

Low, F. N. **The peripheral visual acuity of 100 subjects.** Amer. Jour. Physiology, 1943, Oct. 1, pp. 83-88.

Peripheral visual acuity may be trained, and is largely independent of central vision. One hundred persons (87 males and 13 females) aged 17 to 70 years, including eight color-blind, were examined with a special apparatus to test their peripheral visual acuity. The apparatus consisted of a 25-cm. perimeter with especially constructed illuminator, target carrier, targets, and test objects. Nine points on the temporal peripheral field of each eye were tested in each meridian, the meridians being 45 degrees apart. Fixation was checked by the examiner observing the subject's eye. Each eye was tested separately, the whole test requiring from 40 to 60 minutes. The variation of peripheral visual acuity varies widely, the best subject being about 3½ times the normal and 8½ times the most subnormal. On the whole, these tests verify the well-known visual acuity curves of Wertheim. Charles A. Bahn.

Simonson, E., Fox, M. S., and Enzer, N. **Influence of vestibular stimulation on the fusion frequency of flicker in normal subjects and in patients with postconcussion syndrome.** Arch. of Otolaryng., 1943, v. 38, Sept., p. 245.

The resting value of the fusion frequency of flicker was determined for 16 normals and 16 postconcussion patients. Of the latter, eight showed depression. Caloric vestibular stimulation was then found to have decreased the fusion frequency of flicker in the 16 normal subjects, but to have increased it in 14 of the 16 patients with postconcussion syndrome. This deviation occurs later and lasts longer than the reactions of nystagmus and dizziness, and reveals pathologic deviations in a greater number of subjects than the use of the nystagmus reaction alone. The test is thought by the authors to be a useful clinical test.

Robert N. Shaffer.

2

THERAPEUTICS AND OPERATIONS

Berens, Conrad. **An illuminated retractor for eye operations, especially for detachment of the retina.** Amer. Jour. Ophth., 1944, v. 27, March, p. 281. (One figure.)

Falls, H. F. **A word of caution in use of pentothal sodium in ophthalmic surgery.** Arch. of Ophth., 1944, v. 31, Feb., pp. 134-137.

Pentothal sodium, a short-acting barbiturate, has been quite popular as

a general anesthetic for intravenous administration. The drug is potentially dangerous, since it has a depressing effect on the medullary respiratory center. There is a lack of adequate signs of impending respiratory failure, making the margin of safety too narrow to permit its unqualified use. Intravenous administration of the drug makes it possible for the anesthetist to be out of the surgeon's way. This, combined with the ease and rapidity of induction, makes it a convenient anesthetic. Its use is contraindicated in children, in patients with renal or hepatic disease, and in cases of increased intracranial pressure. The drug is not suitable for long surgical procedures which require deep muscular relaxation.

The author summarizes the results obtained from the administration of pentathal sodium in 147 consecutive and unselected ophthalmic operations. Apnea occurred in eight cases, in one of which it terminated in death. The case histories of the patients developing apnea are given in some detail. The fatality occurred in a man of 76 years during enucleation for a painful secondary glaucoma. Respiratory failure developed after cessation of painful stimuli. Artificial respiration, oxygen under pressure, intracardiac injection of epinephrine, injection of nikethamine and painful peripheral stimulation failed to restore respiration. The patient had severe generalized arteriosclerosis and arteriosclerotic heart disease. Recovery was satisfactory in the other seven cases of apnea. One of the patients ceased breathing after having been taken to the ward, illustrating the necessity of observing the patients for some time. Other complications observed included postoperative restlessness, nausea, vomiting, and coughing. The author states that the severe cases of apnea resulted from faulty administration but illustrate the potential danger of the drug. Method of administration and care of complications are discussed. (5 tables, references.)

John C. Long.

Fitzpatrick, Roberto. **Mydriasis medicamentosa.** Anales de la Soc. Mexicana de Oft. etc., 1943, v. 18, Sept.-Dec., pp. 37-42.

A historical review of the development and use of cycloplegic and mydriatic drugs and their application to various purposes in ophthalmology. (References.) Eugene M. Blake.

Foster, J. **Preoperative cultures and antisepsis.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 329-335.

After many years of routine conjunctival culture preceding cataract operation, the author began to doubt the value of the practice as no infections developed in other intraocular operations for which routine cultures were not made. In cataract cases that became infected there was good reason to suspect that the patients had introduced infection by poking their fingers under the bandage. Colleagues who did not make conjunctival cultures had no difficulties with infection. The writer suggests that the use of preoperative antisepsis tends to reduce the resistance of the eye. He states other reasons for reduction in postoperative infection, including improved method of instrument sterilization, better selection of cases, improved treatment of such general conditions as anemia and diabetes, the wearing of masks by surgeons with upper air-passage infection, improved operative technique, and eye shields which reduce access by the patient's fingers to the eye. (3 tables, references.) Beulah Cushman.

García Miranda, A. **Avitaminosis in ophthalmology.** Arch. de la Soc. Oft. Hisp. Amer., 1942, v. 1, Oct., pp. 344-377.

This is an up-to-date review of the present status of vitamins in ophthalmology. The role played by vitamins A, B complex, C, D, E, and K in ocular affections is thoroughly discussed.

Ramón Castroviejo.

Gundersen, T., and Liebman, S. D. **Effect of local anesthetics on regeneration of corneal epithelium.** Arch. of Ophth., 1944, v. 31, Jan., pp. 29-33. (See Section 16, Injuries.)

Keyes, J. L. **Recent advances in clinical ophthalmology.** Ohio State Med. Jour., 1943, v. 39, Dec., p. 1110.

Indications, effectiveness, dosages, and contraindications to the use of the sulfonamides and penicillin in ophthalmologic conditions are discussed.

Thygeson's summary of the use of the sulfonamides in the viruses of trachoma, inclusion conjunctivitis, and lymphogranuloma, and in ocular infections due to gonococcus, meningococcus, alpha and beta hemolytic streptococcus, staphylococcus, pneumococcus, influenza bacillus, diplobacillus, coliform rods, Friedländer's bacillus, and pyocyaneus bacillus is quoted.

Sulfadiazine is the drug of choice for internal medication. Local application of 5-percent sulfathiazole or sulfadiazine in an ointment composed of 100 percent hydrous wool fat is most effective, although a base of 25-percent hydrous wool fat and 75-percent petrolatum is nearly as efficient. Local drops of 3 to 5-percent sodium sulfathiazole (water-soluble) is useful, although occasionally irritating after prolonged use because of the alkaline pH. Adequate dosage of any of the sulfonamides, used orally, and adequate duration of therapy are stressed because of the risk of developing a sulfa-fast strain of infecting organisms, or of the danger of a relapse.

Optimum blood-sulfadiazine levels lie between 7 and 13 mg. per 100 c.c. In adult males of army age this is best assured by an initial dose of 4 gm. and subsequent dosage of 1 gm. every four hours for the first 24-hour period. Once the level is established it can usually be maintained by 1 gm. every five or six hours. Alkalinization is maintained by roughly corresponding doses of sodium bicarbonate. Sodium citrate is substituted the third day if the urine is alkaline to litmus paper.

Penicillin so far is effective locally and systemically in infections caused by streptococcus hemolyticus, staphylococcus aureus, pneumococcus, gonoccoccus, meningococcus, B. diphtheriae, and Koch-Weeks bacillus. Further analogy between penicillin and the sulfonamides is noted in that organisms may become fast to either drug, and also that bacteriostatic rather than bacteriocidal action is characteristic of each.

The activity of penicillin is greatly reduced in the presence of colon bacilli. Instillation and parenteral use of penicillin are effective. Concentrations of penicillin up to 5,000 units per c.c. are tolerated in eye instillations. Instillation every half to one hour is advised for acute phases, with gradual diminution until several days after clinical cure. Intravenous and intramuscular dosages of penicillin range from 5,000 to 15,000 units administered every two or three hours, with a total maximum dosage of 120,000 units in 24 hours.

Hospitalization for treatment with penicillin in advised, because of the

scarcity of the drug and its rapid tendency to deteriorate.

Owen C. Dickson.

Knight, H. C., Emory, M., and Callahan, N. **Hyperpyrexia in the treatment of acute ocular inflammations.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 381-388. (5 tables, references.)

Steinhaus, A. H., and Kelso, A. **Improvement of visual and other functions by cold hip-baths.** War Med., 1943, v. 4, Dec., p. 610.

Cold hip-baths lasting 10 to 20 minutes are shown to produce striking temporary improvement in binocular vision, visual acuity, critical fusion frequency, and psychomotor reactions. These baths have been maintained at least six hours without after-depression being observed. It is suggested that they be tried in those aspects of warfare and industry that involve monotonous routine duties demanding acute vision and alert performance.

Robert N. Shaffer.

Von Sallmann, L., and Meyer, K. **Penicillin and sulfadiazine in the treatment of experimental intraocular infections with Staphylococcus aureus and Clostridium welchii.** Arch. of Ophth., 1944, v. 31, Jan., pp. 54-63.

The authors' study, previously reported, of the chemotherapy of intraocular infections of the anterior segment with Diplococcus pneumoniae has been extended to infections with Staphylococcus aureus, which in frequency stands second to D. pneumoniae as a cause of posttraumatic and postoperative purulent endophthalmitis. Clostridium welchii was selected as a representative of the anaërobe group. The effect of oral administration of sulfadiazine in combination with the topical use of its sodium salt was again compared with that of local treatment with penicillin.

The inoculation was carried out as follows: The needle was introduced into the anterior chamber near the limbus at the 12-o'clock position, and a large, deep slit was made in the anterior cortex of the lens. Aqueous was withdrawn into a syringe, and, after proper adjustment of the stopcock, the net amount of 0.05 c.c. of a 10^{-4}-dilution of an 18-hour broth culture was injected into the anterior chamber. The number of viable organisms injected, as calculated by plate counts, varied from 5,000 to 10,000. After withdrawal of the needle an attempt was made to seal the puncture canal with a heated probe. Treatment was initiated six to seven hours after inoculation, and consisted of iontophoretic introduction of sulfadiazine or penicillin.

The clinical and histologic inflammatory changes observed six hours after inoculation of the eyes of rabbits were caused in great part by the trauma of the injection. To this category belong a dense fibrinous exudate in front of the pupil, dilatation of the capillaries in the iris and the ciliary body, an obvious increase in protein content of the aqueous, the presence of a few polymorphonuclear leucocytes in the iris and the anterior chamber, and a characteristic edema of the ciliary processes in the form of numerous Greeff blebs.

The authors conclude that the technique described is a reliable standard lesion for chemotherapeutic experiments as to Staph. aureus. Combined oral and topical use of sulfadiazine was beneficial in 21.7 percent of the eyes with purulent endophthalmitis so produced, if treatment was initiated six to seven hours after inoculation. Penicillin, applied topically with the first

treatment six to seven hours after inoculation, controlled the infection definitely in 62.5 percent and possibly in 75 percent of the eyes.

Intralenticular injections with Cl. welchii caused destructive endophthalmitis; and neither sulfadiazine nor penicillin therapy begun six hours after such injections had any effect on the resulting endophthalmitis. (References.) R. W. Danielson.

Von Sallmann, L., and Meyer, K. **Penetration of penicillin into the eye.** Arch. of Ophth., 1944, v. 31, Jan., pp. 1-7.

The good results from penicillin in treatment of some experimental intraocular infections of the anterior segment of the eye, and the antibacterial activity of penicillin in vitro against most organisms found in intraocular infections, suggested a study of the penetration of penicillin into the anterior chamber.

The investigations on the topical use of penicillin deal, first, with the entrance of penicillin into the aqueous of rabbits after iontophoresis as compared with that after the corneal bath; second, with the influence of wetting agents on the penetration of penicillin; and, finally, with the possibility of its introduction by repeated use of solutions or ointments with and without wetting agents. The studies on systemic application are limited to determinations of penicillin in the blood, the spinal fluid, and the intraocular fluids after single intramuscular injections.

Iontophoretic introduction of a 0.25-percent solution of sodium penicillin into the aqueous led in 45 minutes to maximal concentration of 40 micrograms per c.c. The average for this maximal concentration was about three times as great as that obtained with a solution of 0.1-percent sodium penicillin and was almost ten times as great as the average concentration in the aqueous 45 minutes after a single corneal bath with a 0.25-percent solution. A small amount of penicillin was found in the aqueous after four hours only, following iontophoretic introduction of a 0.25-percent solution. The increased speed of penetration under the influence of an electric current is demonstrated by the results of determination of penicillin in the aqueous 15 minutes after application. Whereas no trace of penicillin was detected after a corneal bath, the presence of 16.6 micrograms per c.c. was estimated after ionization with a 0.25-percent solution. No detectable amount of penicillin was found in the vitreous withdrawn in two experiments one hour after the transcorneal iontophoretic introduction of a 0.25-percent solution of sodium penicillin.

Furthermore, a comparison of the two groups of experiments demonstrates that the use of nupercaine as a local anesthetic is almost as effective in increasing the penetration of penicillin into the anterior chamber as is the addition of wetting agents to the penicillin solution in its application with general anesthesia. As these experiments were confined to the use of two surface-tension depressants, no generalization can be made as to the value of other wetting agents for use with penicillin.

Repeated applications of solutions and ointments containing penicillin did not produce any detectable antibacterial activity of the aqueous. The addition of wetting agents was without effect. Small amounts of penicillin entered the aqueous from the blood stream. Secondary aqueous contained several times as much penicillin as

primary aqueous. (3 graphs, references.) R. W. Danielson.

Wegener, H. P. **Toxic effects of sulfonamides on the eyes.** Amer. Jour. Med. Sciences, 1943, v. 206, Sept., pp. 261-268.

The author reviews in detail the literature on this subject. It has been proved that the sulfonamides are present in all of the ocular tissues in a concentration somewhat below the blood level. One of the commonest reported toxic manifestations is a change in refraction, an induced myopia that is usually very transient and is probably due to edema of the lens. Another common finding is transient edema and irritation of the lids and conjunctiva. Rarer, but important, lesions reported are optic neuritis and hemorrhagic retinitis. In most of these cases recovery occurred without permanent damage. In some studies in normal individuals it was found that there was no significant change in the visual acuity and peripheral field, but definite effect on the muscle balance and depth perception was noted. All of these studies showed no significant difference in the toxicity of the various sulfonamides.

T. E. Sanders.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Berens, C., and Sells, S. B. **Experimental studies on fatigue of accommodation.** Arch. of Ophth., 1944, v. 31, Feb., pp. 148-159.

Accommodative fatigue was studied on 57 clinic patients complaining of ocular fatigue or other symptoms of asthenopia. Twelve different experiments were carried out on these patients, fatigue being produced by the use of the Howe-Berens ophthalmic ergograph. The data are recorded in detail in 13 tables. It was observed that a period of exercise on the ophthalmic ergograph resulted in a recession of the near point. This is regarded as evidence of fatigue of accommodation. When the experiments were conducted with one eye occluded it was found that both eyes manifested fatigue, the occluded eye to a lesser degree than the "working eye." (2 figures, 13 tables, references.) John C. Long.

Hamilton, W. F., Briggs, A. P., and Butler, R. E. **The testing of color vision in relation to vitamin-A administration.** Amer. Jour. Physiology, 1944, v. 140, Jan. 1, p. 578.

That vitamin therapy may affect retinal pigmentation and enable a subject to pass color-vision tests as he can do with rose-colored glasses is not impossible. If it did so, however, it would not improve wave-length discrimination.

Tests revealed no change in dichromats after massive vitamin-A therapy. The Ishihara test gave a correct diagnosis, since the cases were classified as green-blind and by examination with spectral light they were dichromats with a long spectrum.

Twelve of the "Ishihara-blind" subjects were trichromats who could discriminate colors throughout the spectrum. About one half of these men had thresholds close to the average of the population, and one half somewhat higher in the orange to green. Only one of the 13 subjects showed a change from partially red-green blind to normal under large doses of vitamin A, and he lapsed to the original diagnosis when his blood concentration returned to its original level.

About one half of the group discarded under the Ishihara test can be

shown to have normal wave-length discrimination. The authors feel that this group, although able to see and name the colors of the dots, are unable to arrange them into a figure. Failure then is in building up a mental pattern and seems to be psychic rather than sensory. Some of the men who see the figure have less wave-length acuity than some who do not.

Evidence therefore leads to the conclusion that the Ishihara and similar tests do not tell whether the individual can discriminate hue, but gave rather confused information as to whether he is or is not anomalous in the manner in which he arranges his visual field into patterns. Owen C. Dickson.

Harris, R. H. **Comparison of the Ishihara and the American Optical Company series of pseudoisochromatic plates.** Arch. of Ophth., 1944, v. 31, Feb., pp. 163-164.

Examination of color vision was carried out on 1,471 applicants for army air crew training by use of both the Ishihara series of plates and the plates of the American Optical Company. The applicant failed if he missed 25 percent or more of the plates in either series. It was found that 6.6 percent failed with the Ishihara tests, while 5.7 percent failed with the American Optical Company plates. It is concluded that the Ishihara series of plates meets the demands better than the American Optical Company plates because with the former the examination is less time-consuming and the elimination of candidates with subnormal color perception is more thorough. Further, the plates are less easily available to color-deficient candidates who wish to become familiar with them for the purpose of passing the examination.

John C. Long.

Reeder, J. E., Jr. **The psychogenic color field.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 358-361. (4 fields, 1 table.)

Sloane, A. E. **Refraction clinic.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 407-409.

4

OCULAR MOVEMENTS

Argañaraz, Raul. **Ocular torticollis.** Arch. de Oft. de Buenos Aires, 1942, v. 17, July, p. 379.

The importance of ocular torticollis is stressed. The actions of the rectus and oblique muscles are explained in detail as the basis of the mechanism of production of the vicious positions of the head in vertical strabismus. Ocular torticollis is found associated with paralytic vertical strabismus and with functional vertical strabismus. The first variety is more frequently related to paralysis of the superior oblique, although underaction of any of the other vertical muscles can produce it. It is due to a reflex stimulus originating in the labyrinth and semicircular canals in order to maintain the correct position of the planes of the eye. The torticollis associated with functional or spastic vertical strabismus is more frequently caused by spasm of the inferior oblique, but spasms of the superior or inferior rectus muscles may also give rise to it. The underlying cause is not a paralysis, but a permanent spastic contracture of the muscle. (Illustrations, photographs.)

Plinio Montalván.

Malbrán, Jorge. **Concerning paralysis of the inferior oblique.** Arch. de Oft. de Buenos Aires, 1942, v. 17, June, p. 337.

The extreme rarity of individual paralysis of the inferior oblique muscle is stressed, and the literature on the subject is reviewed and brought up to date. The author then reports six cases of paralysis of the inferior oblique which have come under his observation. In the first case, which occurred in a 16-year-old girl during epidemic parotitis, the paralysis was limited to the right inferior oblique, without involvement of the other extraocular muscles, while in the remaining five cases the paralysis was accompanied by convergent strabismus. (Bibliography, photographs.)

Plinio Montalván.

5

CONJUNCTIVA

Almeida Toledo, Silvio de. **Considerations as to the etiology of trachoma.** Arquivos Brasileiros de Oft., 1943, v. 6, Oct., pp. 163-192.

This thirty-page article is a review of the literature of the subject, with a bibliography of 73 references.

Director, William. **Fixed eruption conjunctivitis and fever from sulfathiazole.** Arch. Derm. and Syph., 1943, v. 48, Nov., p. 523.

Cutaneous reactions from sulfonamide compounds are not infrequent, but conjunctivitis, as a reaction, is less common. The author reports one case of fixed dermatitis, conjunctivitis, and fever. The term "fixed" is used in the sense that in recurrences the dermatitis is confined to the same site.

A diagnosis of lymphogranuloma venereum was established and sulfathiazole was given daily. One day after therapy was started macules appeared on the neck. Papules appeared on the forehead, and both conjunctivas became diffusely injected. After the fourth day sulfathiazole was discontinued. The drug lesions faded the next day, and two days later they were almost completely gone.

After recurrence of the swelling in the left inguinal lymph nodes the patient again was given a total of 3.5 gm. of sulfathiazole for two days. At noon of the second day there was a recurrence of the eruption on the same sites as had been previously affected. The use of sulfathiazole was discontinued. Twenty-four hours later the eruption had subsided, only slight erythema remained, and the conjunctival injection had completely faded.

The patient was given 0.5 gm. of sulfathiazole and the following observations were made. (1) Elevation of temperature, with malaise, appeared first after an interval of 4 hours and 15 minutes, rose slowly to 102.6 F. in 2 hours, remained there for 3 hours, and slowly subsided to normal in 6 hours; a total febrile period of 11 hours. (2) Conjunctival injection and dermatitis of fixed sites on the neck and forehead appeared together after a latent period of 5 hours and 45 minutes. The injected conjunctival vessels appeared first at the inner canthi and spread laterally. The injection disappeared completely in 24 hours. Dermatitis subsided completely in 36 hours. From the clinical description it appeared that the shock organ of the skin and conjunctiva was vascular, the reaction consisting of dilatation of the small vessels of the conjunctiva and vasodilatation and increased permeability of the small vessels of the corium in the area affected by dermatitis.

Theodore M. Shapira.

Griffey, W. P. **Penicillin in treatment of gonorrheal conjunctivitis.**

Arch. of Ophth., 1944, v. 31, Feb., p. 162.

A man aged 24 years developed a gonorrheal urethritis and conjunctivitis which proved resistant to sulfathiazole. Treatment consisting of sulfathiazole and intravenous injections of typhoid vaccine were carried out over a period of about six weeks. At the end of this treatment the urethral discharge had subsided considerably but the ocular infection with a copious purulent discharge persisted. The gonococcus could be demonstrated by smear and culture from both the conjunctiva and urethra. Treatment was then changed to the intramuscular injection of penicillin sodium. Twenty-five thousand units were injected every three hours for a total of ten injections. Hourly cultures of the conjunctiva and urethra were made. These cultures were positive for the first five hours, after which time they were persistently negative. Marked improvement was noted in the clinical appearance of the eye within ten hours of beginning treatment. Prompt and complete recovery took place. (4 photographs.)

John C. Long.

Lever, W. F. **Pemphigus conjunctivae with scarring of the skin.** Arch. Derm. and Syph., 1944, v. 49, Feb., p. 113.

Three cases of conjunctival pemphigus are presented. The literature contains reports of only eight similar cases. The author considers this a distinct variety of pemphigus because of its chronic and benign course, predilection of lesions for mucous membranes, particularly the conjunctiva, and their tendency to form scars. The lesions always scar the conjunctiva. Frequently the other mucous membranes, and occasionally skin, develop similar terminal changes. Robert N. Shaffer.

Lever, W. F. **Severe erythema multiforme . . . development of cicatricial conjunctivitis and dermatitis in one case.** Arch. Derm. and Syph., 1944, v. 49, Jan., p. 47.

Severe erythema multiforme starts abruptly with high fever and important constitutional signs. An extensive predominantly bullous eruption of the skin and mucous membranes develops within a few days. Despite the severe clinical picture fatalities are rare. Recovery is usually complete in a few weeks. The only area where permanent damage may result is in the eyes, where conjunctivitis is common. In mild form no harm is done, but the severe varieties may lead to conjunctival scarring, corneal ulcers, and panophthalmitis. In the chronic stage the picture is identical with that of pemphigus conjunctivae. Two cases here reported had ocular involvement.

Robert N. Shaffer.

Thygeson, Phillips. **Primary meningococcic conjunctivitis treated by sulfadiazine.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 400-401.

6

CORNEA AND SCLERA

Anthony, E. W., and Marshall, D. **Erythema nodosum episcleritis.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 398-400. (One illustration, references.)

Belfort Mattos, W. **Syphilis of the sclera.** Arquivos Brasileiros de Oft., 1944, v. 6, Oct., pp. 157-162.

Two cases are reported. A girl of fifteen years, of good family, came first in September, 1930, on account of a

refractive error. She had been having an annual course of antiluetic treatment, but was intolerant to bismuth and also to the arsenicals. She was seen on two subsequent occasions, without important change of condition. In December, 1932, she came with an incipient iritis, with exudates in the anterior chamber. She was placed on vigorous antiluetic treatment, including a carefully selected compound of bismuth. On the tenth day of treatment a previously noted elevation of the upper sclera had developed into a small conjunctival ulcer from which escaped a viscous liquid. In the depths of the ulcer the sclera was seen to be also ulcerated. Three other ulcers developed in the same region, and the grayish color of the uveal pigment became visible. Parenchymatous keratitis appeared in the upper part of the cornea. Under atropine, the pupil maintained maximum mydriasis. In spite of the previous record, three doses of the arsenical known as 914 were given at intervals of a few days, in association with the bismuth preparation. The lesions, stationary until this time, began to cicatrize soon after the first arsenical injection, and healing was complete at the end of 16 days of arsenical treatment. The corneal disturbance gradually quieted down.

The second patient was a married woman of 39 years, with several healthy children. For a year she had had persistent irritation of the right eye, with vitreous floaters. This condition culminated in the formation of a flat scleral elevation of purplish color just above the cornea. The Wassermann reaction was negative, the Kahn reaction positive. The condition improved rapidly under arsenic and bismuth. (2 illustrations.)

W. H. Crisp.

Damel, C. S., and Durando, S. A. **Familial corneal dystrophy of Groenouw.** Arch. de Oft. de Buenos Aires, 1942, v. 17, June, p. 348.

Two cases of familial corneal dystrophy of Groenouw, one of the lattice type and the other of the nodular type, are presented. A complete description of the disease is offered, with a review of the literature on the subject. (Illustrations, bibliography.)

Plinio Montalván.

Fish, W. M. **Ocular rosacea and ariboflavinosis.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 354-358. (3 tables, references.)

Malbrán, Jorge. **Keratoplasty after Castroviejo.** Arch. de Oft. de Buenos Aires, 1942, v. 17, July, p. 403.

The author reports the results of his first eight cases of corneal transplant. Castroviejo's technique was followed in every detail and, with the exception of two cases, corneal grafts from cadavers were used systematically. All the transplants were surgically successful and no eye was lost from infection. Three eyes yielded useful vision, one had a clear graft but was found to have an anterior polar cataract, and four developed opacity of the graft. (Illustrations, photographs.)

Plinio Montalván.

Mutch, J. R. **Hereditary corneal dystrophy.** Brit. Jour. Ophth., 1944, v. 28, Feb., pp. 49-86.

An exhaustive review of the literature on hereditary corneal dystrophy is given, together with a summary of 25 different nomenclatures used by writers on the subject. The author offers a classification based on the mode of transmission of the disease, and which should do much to iron out the

confusion arising from the use of a wide variety of descriptive terms.

Two types of hereditary corneal dystrophy (granular and reticular) are inherited by dominant transmission, and a third type (macular) is inherited by recessive transmission. Groenouw, in 1890, described two cases of "nodular cornea." It has since been proved by Bucklers that these two cases were not of the same type, one being granular, occurring in a middle-aged patient who had no complaint of poor vision and whose opacities were limited to the central region of each cornea, and the other, a macular dystrophy, occurring in a young patient who had very poor vision and whose corneal opacities occupied the entire cornea.

Following is a summary of the author's classification. Granular corneal dystrophy begins in the first decade. The opacities are first seen as fine dots, discs, or circles situated below the epithelium in the axial region of the cornea. These dots often form radial lines, hence the confusion between early granular and lattice-like types. Over a number of years, the opacities multiply and coalesce to form clumps. They are mostly superficial but may reach as deep in the parenchyma as Descemet's membrane. Vision in youth is unimpaired. In the second decade, the refraction usually changes but vision can be kept near normal with glasses. In middle age, vision becomes affected but there is no definite progress of the disease, vision in some cases being good even in later life. In old age, the surface of the cornea becomes slightly irregular. Corneal sensitivity in most cases is normal.

Reticular corneal dystrophy also commences in the first decade of life. Until middle age, no corneal abnormality can be seen by macroscopic examination. The opacities are first seen as transparent nodules like drops of water, surrounded by a fine network of lines which raise the epithelial surface. This surface irregularity causes diminished vision at any early age. Corneal sensation is greatly diminished.

Macular corneal dystrophy commences in the first decade as a fine, diffuse opacity which rapidly occupies the entire cornea. The spots are larger and whiter than in the granular type. In the center of the cornea, the spots are superficial but at the periphery they are deep. The epithelium is irregular and often traversed by pigment lines. Corneal sensitivity is greatly diminished. Vision is affected early and by middle age is reduced to counting fingers.

Illustrations serve to make these differences clear. The common factors of all types and their major differences are set forth in concise tabular form. The author reports a series of investigations undertaken in connection with one of his cases of hereditary corneal dystrophy. (7 illustrations, 1 graph, tables, extensive bibliography.)

Edna M. Reynolds

Stocker, F. W., and Prindle, R. E. **A new type of pigment line in the cornea.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 341-345. (3 illustrations, 2 in color, references.)

Tarik Oezerengin. **A case of interstitial keratitis in association with acquired syphilis.** Göz Klinigi, 1943, v. 1, Sept., p. 53.

A 40-year-old housewife had acquired syphilis from her first husband. The family history gives no hint of congenital lues. The left eye was normal. The right eye showed typical interstitial keratitis, and a special feature in the form of numerous precipitatelike yel-

lowish-white prominences on the posterior surface of the cornea. There were also posterior synechias. Antiluetic treatment improved the condition to a certain degree, but there were several relapses. Joseph Igersheimer.

Theodore, F. H. **Congenital opacities of the cornea.** Arch. of Ophth., 1944, v. 31, Feb., pp. 138-143.

In six cases here reported the patients were born with deep opacities of the cornea to which anterior synechiae were attached. Two of the patients were sisters. The opacities were of two types: one of greater density, generally located centrally or nearly so, and the other consisting of a peripheral membrane arising from tissue in the anterior-chamber angle. Microphthalmos was present in three cases and aphakia was noted in one. Visual acuity depended upon the location of the opacity.

Perhaps the most likely explanation of the defect is that it arises as a congenital anomaly due to faulty development of the ingrowing mesoderm that forms the corneal stroma, the endothelium, Descemet's membrane, the anterior layers of the iris, and the trabecula. The cases reported apparently support this explanation. Another theory ascribes the defect to incomplete separation of the lens vesicle from the surface ectoderm. (8 drawings, references.) John C. Long.

7
UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Adler, F. H., and Scarlett, H. **Juvenile macular exudative choroiditis.** Arch. of Ophth., 1944, v. 31, Feb., pp. 144-147.

In three cases observed in young healthy adults, neither trauma nor antecedent illness seemed related to the condition. All three cases apparently correspond to the diagnostic entity described by Junius. The complaint was of a rather gradual decrease in central vision in one eye only, which progressed for weeks until visual acuity was approximately 6/100, with an absolute central scotoma corresponding in size and shape to the ophthalmoscopically visible macular lesion. The macular lesions were somewhat oval in shape, circumscribed and pigmented, and in places seemed to be covered with connective tissue. A number of small hemorrhages seen around the edges seemed to come from under the pigmented mass. At no time was there any evidence of inflammation. There was no ciliary flush, no deposits on the posterior surface of the cornea, no aqueous flare, no vitreous opacities, and no edema of the retina surrounding the lesions. During the period of observation of from six months to a year there was a gradual improvement in vision, to 6/40 in two cases and to 6/12 in another case.

There is discussion of the differential diagnosis between juvenile macular choroiditis and acute macular choroiditis, tuberculosis of the macula, benign lymphogranuloma, choroidal and subchoroidal hemorrhage in the macula, nevus and malignant melanoma, heredodegeneration and familial degeneration of the macula, and juvenile disciform degeneration. It is thought that juvenile macular choroiditis is probably due to choroidal or subchoroidal hemorrhage, as is likely the case in the senile type of disciform degeneration. (4 fundus drawings, references.) John C. Long.

Bender, M. B. **The reaction of the smooth muscle of the denervated iris**

in anaphylaxis. Jour. of Immunology, 1943, v. 47, Dec., p. 483.

The smooth muscle of the iris contracts during in-vivo anaphylaxis in the guinea pig, rabbit, dog, and cat, and to some extent in the monkey, even if the eyeball has been parasympathetically denervated. If the eyeball is completely denervated the pupil contracts in dog and cat but not in rabbit or monkey. Thus the miosis is not dependent on the nervous system and is probably due, besides histamine, to liberation of a slowly acting substance. Atropine does not block pupillary contraction, so that acetylcholine can not be held responsible for the contraction.

R. Grunfeld.

Damel, C. S., and Meroni, J. C. A. **Typical coloboma of lens, iris, and choroid.** Arch. de Oft. de Buenos Aires, 1942, v. 17, June, p. 357. (See Section 9, Crystalline lens.)

Langworthy, O. R., and Ortega, L. **The iris. Innervation of the iris of the albino rabbit as related to its function. Theoretical discussion of abnormalities of the pupils observed in man.** Medicine, 1943, v. 22, Dec., p. 301.

To explain the pupillary movements, the authors assert, it is not necessary to assume that two antagonistic muscles innervated by two separate autonomic nerve fibers are balanced against each other. The dilator muscle, innervated by the sympathetic, furnishes merely a general tonic background upon which the sphincter acts as long as stimulus is applied to the parasympathetic. The iris is characterized by an enormous vascular supply innervated by the sympathetic. Construction of the iris vessels (it is here argued) produces a dilatation, and enlargement of the vessels a constriction, of the pupil. If a dye is injected into the vessels of an iris sector, this sector becomes wider and the pupillary edge becomes flattened, producing an irregularity of the pupil. An irregular pupil can be produced when the blood vessels of one sector receive more fluid than the other sectors. With the raising or lowering of the pressure of the injecting fluid the pupil becomes smaller or larger.

Although the majority of neurologists ascribe the Argyll Robertson pupil to a lesion at the upper end of the midbrain, the authors believe that a peripheral injury in the region of the iris explains the abnormalities of the pupil in a more satisfactory way than a lesion in the central nervous system, as well as explaining more easily a unilateral Argyll Robertson pupil. Lesions producing changes in the iris in syphilis are alleged to be peripheral, in the region of the iris itself, damaging the sympathetic, parasympathetic, and sensory nerve fibers of the pupil.

R. Grunfeld.

Purvis, V. B. **Bilateral buphthalmos with congenital anomalies of iris and subluxated lens.** Proc. Royal Soc. Med., 1943, v. 36, Oct., p. 627. (See Section 8, Glaucoma and ocular tension.)

Vail, Derrick. **Chorioretinitis associated with toxoplasma.** Proc. Royal Soc. Med., 1943, v. 36, Oct., p. 629. (See Section 10, Retina and vitreous.)

Wegener, H. P. **Senile changes in the choroid and retina.** Amer. Jour. Med. Sciences, 1944, v. 207, p. 258. (See Section 10, Retina and vitreous.)

8

GLAUCOMA AND OCULAR TENSION

Athens, A. G. **Diagnosis of glaucoma.** Minnesota Med., 1944, v. 27, Jan., p. 21.

Good therapeutic results in glaucoma are to a considerable extent contingent on its early recognition. The author makes a plea that the general practitioner pay particular attention to the early signs and symptoms of glaucoma in his patients. The initial signs of compensated glaucoma are tabulated, such as fullness of the eyes after a motion picture, or after drinking coffee or other stimulant, decreased dark adaptation, frequent changes of glasses, and halos.

It is recommended that the internist and general practitioner become familiar with some form of tangent screen and the value of visual fields. Particular stress is laid on use of the ophthalmoscope on every patient, in order to be able to recognize glaucomatous changes in the disc.

Owen C. Dickson.

Purvis, V. B. **Bilateral buphthalmos with congenital anomalies of iris and subluxated lens.** Proc. Royal Soc. Med., 1943, v. 36, Oct., p. 627.

A 25-year-old laborer complained of vision having been defective since birth. For the last few weeks he had seen rainbow colors. He had bilateral buphthalmos. Vision of the right eye was reduced to hand movements and in the left was correctable to 5/60 with glasses. The tension was 50 mm. Hg. The discs were grossly cupped. The visual field was reduced to five degrees in the left eye, and in the right eye the visual field could not be charted for lack of fixation. The patient had ectopic pupils displaced down and out and splits in the iris mesoderm. One of the splits was complete, with accompanying tear in the ectoderm, through which a red reflex was obtainable. The splits were not of true polycoria type, for the accessory pupils had no individual sphincters. R. Grunfeld.

Schoenberg, M. J. **A report on defects found in tonometers examined at the checking station of the National Society for the Prevention of Blindness.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 368-372. (One illustration, one table.)

Smith, V. M. **The problem of prevention of blindness among glaucoma patients.** Med. Woman's Jour., 1943, v. 50, Dec., p. 301. (See Section 18, Hygiene, sociology, education, and history.)

9

CRYSTALLINE LENS

Damel, C. S., and Garbarino, A. **Anterior lenticonus.** Arch. de Oft. de Buenos Aires, 1942, v. 17, June, p. 363.

The extreme rarity of anterior lenticonus is stressed and a case reported in which both eyes were affected. The area of the lenticonus presented a very high myopia, while the rest of the lens was practically emmetropic. The authors succeeded in improving the vision substantially by using a plano lens with the myopic correction ground at the center in an area of seven millimeters. (Bibliography.)

Plinio Montalván.

Damel, C. S., and Meroni, J. C. A., **Typical coloboma of lens, iris, and choroid.** Arch de Oft. de Buenos Aires, 1942, v. 17, June, p. 357.

After discussing the possible mechanism of production of lens coloboma, the authors report a case in which the lower portion of the left iris, lens, and choroid presented a typical coloboma, with considerable visual loss in the affected eye. (Bibliography.)

Plinio Montalván.

Georgariou, P., and Wolfe, O. **Cho-**

lesterinosis lentis. Amer. Jour. Ophth., 1944, v. 27, April, pp. 394-397. (References.)

Kirby, D. B. **A system of intracapsular cataract extraction.** Ophth. Ibero Amer., 1943, v. 5, no. 2, pp. 95-106 (in English), pp. 106-117 (in Portuguese).

The author repeats, for the South American reader, details already published as to indications for and technique of the intracapsular operation. Particular attention is given to the possibility of grasping the lens at its upper margin. This can be done even when iridectomy is not performed, the blades of the capsule forceps being slid beneath the iris in order to take hold of the anterior face of the equatorial region of the lens capsule. In case of resistant, elastic zonular lamella, the author is now prepared definitely to recommend use of his method of stripping the zonular lamella from the upper equator while the forceps holds the lens away from the vitreous, and provided that the vitreous appears to remain in its normal position behind the elevated lens margin. (References.)

W. H. Crisp.

Rolett, D. M. **Juvenile cataract in association with dermatosis.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 389-393. (2 tables, references.)

10

RETINA AND VITREOUS

Damel, C. S., and Travi, O. C. **Unusual evolution of a pre-retinal hemorrhage.** Arch. de Oft de Buenos Aires, 1942, v. 17, July, p. 421.

The authors report a case in which eight months after the onset of a juxtapapillary choroiditis in the right eye, a large preretinal hemorrhage appeared in the other eye. At a subsequent visit, a month and a half later, it was observed that the hemorrhage had been transformed into a mass of milky-white fluid. The authors speculate on the changes the blood might have undergone and are inclined to believe that the white fluid may have resulted from fatty degeneration of the white blood-cells with destruction and disappearance of the red corpuscles.

Plinio Montalván.

Denison, W. C. **Retinitis proliferans (Eales's disease).** U. S. Naval Med. Bull., 1944, v. 42, Jan., p. 180.

A 23-year-old shipfitter complained of blurred vision of the left eye lasting three months, and of sudden blurring of the right eye the past four days. The right vision was 20/50, the left 10/200. The visual fields were greatly contracted. Ophthalmoscopic examination revealed a large organized blood clot in the superior retinal region, with stringy clots extending into the vitreous of the right eye. In the left eye extensive, old hemorrhages were found in the disc and macula, and over a large area in the retina. A thin circular membrane with fine newly-formed blood vessels penetrated into the vitreous.

During the man's stay in the hospital no new hemorrhages were seen in the left eye, but retinal venous hemorrhages involving the disc and macula were seen in the right eye every week for seven weeks. Vision in the right eye diminished to 20/100. No noticeable improvement followed treatment with vitamins, calcium lactate, calcium gluconate, or potassium iodide. The etiology remained undetermined.

R. Grunfeld.

Lijo Pavia, J. **Central retinal artery. Induced pulsation. Its analysis by**

means of cinematography. Arch. de Oft. de Buenos Aires, 1942, v. 17, July, p. 412.

By means of cinematography of induced arterial pulsation of the fundus an analytic study of arterial pulsations in general can be carried out. The author, who has pioneered in this field, has gradually improved his original technique and uses supersensitive panchromatic motion-picture film, exposing 64 frames per second for periods of about ten seconds. After the film is developed, those portions in which the arterial pulsations are more clearly visible are selected and the necessary prints made in order to lengthen the projection time and thus allow careful study of the two component phases of every pulsation. By this method the author studied the induced arterial pulsation in the fundi of two patients with systemic hypertension and was able to show that the phase of arterial contraction was longer than in normal individuals. He interprets this as a sign of latent angiospasm. (Own bibliography.) Plinio Montalván.

Moreau, Angel. **Considerations about hemeralopic retinosis.** Arch. de la Soc. Oft. Hisp.-Amer., 1942, v. 1, Nov.-Dec., pp. 521-553.

The author classifies retinosis in two groups: (1) typical pigmentary retinosis of hereditary etiology. (2) acquired retinosis with subjective and objective pathology similar to that of the first group. The histopathologic changes in the retina and choroid are described in accordance with Morax's studies.

In reference to the mechanism of production of pigment, the author offers lengthy theories about points which are still obscure, discussing at length experimental work done by several authors and the role played by heredity, vitamins, and hormones in the physiopathology of pigment.

In order to understand well the symptomatology of hemeralopic retinosis, the author considers it important to remember the role played by vitamins in the hypophysis in regulating growth, a fact that he has proved experimentally in animals. Experimental work carried out by different authors has led him to believe that pigment is perhaps regulated by a center controlling two hormones; one melanotic, the other adrenalin, which would be antagonistic to the first one.

Experiments performed by the author upon a cat with deficiency of vitamin B_2 lead him to believe that animals lacking lactoflavin cannot produce, or produce a minimum amount of, melanotic hormones. Other experiments carried out on mice convince him that in animals lacking lactoflavin the optohypothalamohypophisopigmentary reflex is absent, demonstrating the role played by lactoflavin in the stimulation of hypophysis through the optic nerve and production of melanotic hormones.

The author attempts to explain the clinical manifestations of hemeralopic retinosis as follows:

(a) In typical hereditary hemeralopic retinosis, heredity and consanguinity have been proved to play a very important role. In this group the author undertakes to prove that primary degeneration does not exist in the pigmentary epithelium but rather in the hypothalamic-hypophysial system. There would be therefore a hereditary disturbance in the production of melanotic hormones and possibly a vitamin deficiency in the hypophysis. The congenital disturbances might be due to congenital syphilis. In this group, when the subjective symptoms of hemeralopia begin to appear without objective

findings, injection of melanotic hormones of hypophyseal extract, together with the administration of vitamin A, may improve the disturbance of dark adaptation.

If the process continues without treatment, the absence of melanotic hormones and the overaction of antagonistic suprarenal hormones create a vicious circle with the typical degenerative changes in the retina and choroid observed ophthalmoscopically. During this late period of the disease, treatment is useless.

(b) In acquired heremalopic retinosis heredity and consanguinity cannot be demonstrated. In this group the pigmentary changes are secondary to infection or vitamin deficiency. If the condition is observed in the incipient stages treatment will be effective, but treatment will be useless if the condition is observed when a great deal of degenerative change has already taken place. (Bibliography.)

Abstracter's comment:

This article does not lend itself very well to abstracting, because the author mixes the histopathologic findings with experimental work and theories regarding the problems he is studying. Also, basing upon theoretical grounds with very little experimental work, he expresses in dogmatic statements conclusions which are not justified by the material contained in the article.

Ramón Castroviejo.

Nuri Fehmi Aybeck. **About the significance of tears in operations on retinal detachment and in barrage operations.** Göz Klinigi, 1943, v. 1, Sept., p. 35.

Three cases of advanced retinal detachment are reported in which, because of vitreous opacities or for other reasons, a tear in the detached retina could not be found. As a last resort a barrage operation was performed. In the first case the time of observation was eight months; during this time vision remained 1/10. In the second case the vision before operation was hand movements, after the operation 1/50. In the third case vision was improved from counting fingers at three feet to 1/10, but it cannot be said whether this was a final result, as the observation time was too short.

Joseph Igersheimer.

Saenz Canales, Jose. **Cyst formation in the vitreous.** Anales de la Soc. Mexicana de Oft., etc., 1942, v. 17, July-Aug., pp. 123-139.

The author divides cysts of the vitreous into three groups. The first comprises those which are located in the anterior part of the vitreous and which have developed from remnants of the vascular hyaloid system. The second group is formed of those in the posterior portion of the vitreous, which are also remnants of the hyaloid vascular system, those of mesodermal origin derived from the embryonal slit, and those of retinal origin. The third group deals with free cysts in the vitreous, either congenital or acquired.

A cyst on the nasal border of the papilla, probably arising from the hyaloid system, is described and pictured. (One illustration.)

Eugene M. Blake.

Smith, H. E. **Actinic macular retinal pigment degeneration.** U. S. Naval Med. Bull., 1944, v. 42, March, p. 675. (See Section 16, Injuries.)

Vail, Derrick. **Chorioretinitis associated with toxoplasma.** Proc. Royal Soc. Med., 1943, v. 36, Oct., p. 629.

The author reviews the literature on toxoplasma associated with choroiditis. Toxoplasma is a highly organized protozoan parasite consisting of a distinct cytoplasm and nuclear chromatin. It is crescentic, pyriform, oval, or round, and measures 6 to 7 microns in length and 2 to 4 microns in width. It produces diseases in numerous animals; among others the mouse, rat, squirrel, dog, monkey, pigeon, and the common fowl. The parasite can multiply only in living cells and can easily be transferred to animals. The mode of transmission to man is unknown.

The ophthalmoscopic findings in both the infantile and adult cases include: bilateral, multiple, circumscribed, exudative choroiditis with predilection for the macular area. Activity of the lesion is characterized by choroidal hemorrhage usually in the direction of the spread of the lesion, whereas healing is revealed by heavy pigmentation sometimes accompanied by proliferative retinitis and (in one case) by retinal detachment. Microphthalmos and other congenital defects are often found in association.

The diagnosis of congenital cases can be made by the clinical tetrad of symptoms: (1) hydrocephalus or microcephalus, (2) cerebral calcification, (3) choroiditis, (4) disturbances of nervous function. In older children and in adults the diagnosis is based on the toxoplasma-neutralization test.

R. Grunfeld.

Wegener, H. P. **Senile changes in the choroid and retina.** Amer. Jour. Med. Sciences, 1944, v. 207, Feb., p. 258.

The author completely reviews the present-day concept of the senile changes occurring in the choroid and retina. These are discussed from both the clinical and pathologic viewpoints. Wegener believes that in future, if these conditions are to be controlled, we must better appreciate the presenile changes. T. E. Sanders.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Barraquer, Tomás. **Ophthalmoscopic aspects of the papilla in some states of hypovitaminosis.** Arch. de la Soc. Oft. Hisp.-Amer., 1942, v. 1, Nov.-Dec., pp. 554-560.

During the recent civil war in Spain, the author saw many cases of hypovitaminosis with the following symptomatology: Hemeralopia and nyctalopia were found to be the initial symptoms of the disease. The lids frequently had areas of hyperkeratosis. In the conjunctiva, several types of conjunctivitis were observed, the most common being phlyctenular keratoconjunctivitis; in these cases the Mantoux test was always positive. The pupil was often found to react sluggishly to light, ptosis was a frequent finding, and some cases showed tropias accompanied by diplopia. Disturbances of the optic nerve were observed in the form of central scotomata with negative ophthalmoscopic pictures, somewhat as in cases of tobacco-alcohol amblyopia. Optic neuritis was also occasionally observed, leading to partial optic atrophy. Anemia was found by the author to have played an important role in the development of these vitamin deficiencies. Treatment was directed to improving the anemic condition, and to administration of vitamins A and B for the improvement of the vitamin deficiency. Ramon Castroviejo.

Folk, M. R. **Optic-nerve atrophy in malignant nasopharyngeal tumors.**

Amer. Jour. Ophth., 1944, v. 27, April, pp. 373-380. (6 illustrations, 1 table, references.)

López Enríquez, M. **Amblyopias of the alcoholic nicotinic group due to avitaminosis, or carential (vitamin-deficiency) amblyopias of the alcoholic nicotinic group.** Arch. de la Soc. Oft. Hisp.-Amer., 1942, v. 1, Nov.-Dec., pp. 568-577.

During the recent civil war in Spain, the author was able to study 24 cases of amblyopia with the same characteristics as those observed in cases of alcohol-and-tobacco intoxication. The fact that some patients did not smoke or drink led the author to the conclusion that amblyopias similar to those of alcohol-and-tobacco intoxication were caused by vitamin deficiency. Subjectively, diminution of vision and central scotoma were present. Objectively, small whitish dots or arches at or around the macula were observed. Nineteen cases were treated with masculine glandular extracts, strychnine, and vitamin A. Fourteen patients were greatly improved, in two cases the improvement was fair, and three patients became worse.

Ramon Castroviejo.

12

VISUAL TRACTS AND CENTERS

Enríquez, R. G. **Optochiasmatic meningitis.** Anales de la Soc. Mexicana de Oft., etc., 1943, v. 8, May-Aug., pp. 17-31.

The ocular symptoms of this intracranial disease are described at length. The most frequent sign is the central scotoma, which was present in 31 percent of the author's cases. A particular symptom is the hemianopsic central scotoma of the temporal portion, due to involvement of the macular fibers of the crossed bundle. This is similar to the cases described by the neurologists as due to plaques of sclerosis, causing compression. In the case mentioned by the author the scotoma was annular, a fact difficult to explain unless one assumes involvement of the arenate fibers between the macular and peripheral bundles. Eugene M. Blake.

Poyales, Ureña. **Contribution to the study of central scotoma due to avitaminosis, or contribution to the study of carential (vitamin deficiency) central scotoma.** Arch. de la Soc. Oft. Hisp-Amer., 1942, v. 1, Nov.-Dec., pp. 561-567.

Using Lloyd's stereocampimeter to record the visual fields, the author has been able to study 128 cases of avitaminosis. In 27 percent the fields showed changes in only one eye. In the remaining 73 percent the field changes were bilateral. Visual field changes varied from relative scotoma for color to absolute scotoma including the area corresponding to the macula. In the bilateral cases the field changes were sometimes symmetrical, in other cases similar but not symmetrical, and in a third group asymmetrical.

The treatment employed was administration of 500 mg. daily of nicotinic acid. With this treatment 41 percent were cured, 21 percent improved, 14 percent remained unchanged, and 24 percent became worse in spite of the treatment. Ramon Castroviejo.

Reeder, J. E., Jr. **The psychogenic color field.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 358-361. (4 fields, 1 table.)

Yaskin, J. D., Riggs, M. E., and Torney, A. S. **Bilateral blindness due to lesions in both occipital lobes.** New York

State Jour. Med., 1943, v. 43, Sept. 1, p. 1619.

Bilateral blindness due to lesions in both occipital lobes may be caused by subcortical degenerative processes, trauma, tumors, toxic encephalopathy, and vascular lesions. Vascular lesions produce bilateral blindness through occlusion of both posterior cerebral arteries, or by complete occlusion of the basilar artery In these cases some central (macular) vision may be retained if the occipital poles have an additional blood supply from the branches of the middle or anterior cerebral arteries. In some cases the visual area is affected primarily by changes in the small terminal vessels. Of the six reported cases, four were caused by vascular lesions and were verified by autopsy. One case was due to metastatic carcinoma of the stomach and another was due to a meningioma. Bilateral blindness, when not due to discernible changes in the media, choroid, retina, or optic nerve, or, in early stages, to chiasmal field changes, must be considered as being due to lateral lesions in the geniculocalcarine pathways, especially the occipital lobes, or to psychic causes. The insidious onset of blindness and the masking by associated symptoms make an early diagnosis difficult.

Theodore M. Shapira.

13

EYEBALL AND ORBIT

Blonder, E. J. **Orbital cellulitis complicating a maxillary sinusitis.** Annals of Otol., Rhin., and Laryng., 1943, v. 52, June, p. 524.

A case of orbital cellulitis secondary to maxillary sinusitis, with recovery following surgical drainage of the antrum, is reported. Robert N. Shaffer.

Constans, G. M. **Unusual eye findings in identical twins.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 401-403.

14

EYELIDS AND LACRIMAL APPARATUS

Lee, O. S. **Keratitis occurring with molluscum contagiosum.** Arch. of Ophth., 1944, v. 31, Jan., pp. 64-67.

The umbilicated epithelial nodules of molluscum cantagiosum are usually circular, average 2 mm. in diameter, and are covered with normal epithelium. From the center of the umbilication a cheesy mass consisting of ovoid cells can be expressed. These bodies are composed of swollen and vacuolated epithelial cells. A virus origin has been established, and the disease is transmissible from person to person by material passed through Chamberland filters.

Molluscum contagiosum rarely appears on the eyelids. Its appearance there is similar to that elsewhere on the skin. Nodules along the margins of the lids may produce follicular conjunctivitis.

After a review of the literature the author reports the case of a 24-year-old man who, when first seen, complained of redness, slight itching, pain, and crusting of the lid margins. He was treated for acute catarrhal conjunctivitis. He returned a few days later stating that he had improved under the medication, but that for the past three days there had been profuse lacrimation, severe photophobia, blepharospasm, and the sensation of a foreign body in the eye. The eye changes included edema, follicles in the conjunctiva of the lower eyelid and culdesac, a faint circumcorneal flush, and (as seen with the biomicroscope) small subepithelial and intraepithelial corneal

infiltrates. A small, round, yellow-tinged nodule was seen on the margin of the lower lid. Nothing could be expressed from it by squeezing. Culture and smears were again negative, but microscopic examination of the excised nodule showed the typical histologic appearance of molluscum contagiosum. The patient's ocular condition improved within 24 hours after removal of the nodule.

The mechanism of production of conjunctivitis and keratitis in cases of molluscum contagiosum is not yet clearly understood. Thygeson has expressed the belief that the desquamating material from the molluscum nodule contains a toxic substance which produces the inflammation. All nodules on the margins of the lids should be viewed with suspicion when they are associated with inflammation of the conjunctiva and cornea. Such nodules should be excised for microscopic study whenever possible. (2 illustrations, references.) R. W. Danielson.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
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News items should reach the editor by the twelfth of the month

Deaths

Dr. William W. Gilfillan, New York, New York, died February 10, 1944, aged 75 years.

Dr. Charles H. Hoffhine, Columbus, Ohio, died February 8, 1944, aged 60 years.

Dr. John F. Johnson, Chicago, Illinois, died February 19, 1944, aged 72 years.

Dr. Herbert L. Lake, Lyons, New York, died January 30, 1944, aged 83 years.

Dr. Charles E. Robb, Rock Island, Illinois, died February 27, 1944, aged 62 years.

Dr. Franklin T. Scanlon, Morgantown, West Virginia, died February 25, 1944, aged 65 years.

Dr. Samuel A. Scruggs, Jr., Americus, Georgia, died February 26, 1944, aged 54 years.

Dr. Bert A. Smith, Auburn, Nebraska, died January 11, 1944, aged 55 years.

Dr. John W. Stevenson, Hoquiam, Washington, died January 20, 1944, aged 79 years.

Dr. Charles M. Stiles, Philadelphia, Pennsylvania, died January 27, 1944, aged 77 years.

Dr. J. Boyd Swonger, Beaumont, Texas, died January 26, 1944, aged 75 years.

Dr. Willis Walley, Jackson, Mississippi, died April 9, 1944, aged 66 years.

Societies

At the meeting of the College of Physicians of Philadelphia, Section on Ophthalmology, held on January 20, 1944, Dr. Joseph Igersheimer presented a paper on "Intraocular pressure and transudation across retinal vessels."

The thirtieth meeting of the Reading Eye, Ear, Nose, and Throat Society was held on Wednesday, February 16, 1944, at Valley Forge General Hospital. The program, presented by Lt. Col. James N. Greear, Jr., Chief of the EENT Section, consisted of the following subjects: "Plastic work on war injuries," "A new method of bronchography," "Rehabilitation of blind members of the Armed Forces," "Retinal detachment," and "Injuries to the occipital lobes."

The annual congress of the Ophthalmological Society of the United Kingdom was held at the Royal Society of Medicine, London, on March 31 and April 1, 1944. The presidential address was entitled "The nerve fiber bundle defect." Papers presented during the two-day session were: (1) "Concentric restriction of vision from unilateral cerebral lesion"; (2) "Sphenoidal mucocele as a cause of the ophthalmoplegic migraine syndrome"; (3) "The use of plastic material for scleral wounds"; (4) "The elastic tissue within the eye"; (5) "Hyaline bodies in the intraocular fluids and tissues"; (6) "A sequel to the case of spontaneous cure of retinal glioma"; (7) "Fractures of the orbit"; (8) "Ophthalmic experiences in the East"; and (9) "Radon seeds in the treatment of retinoblastoma."

The thirty-first meeting of the Reading Eye, Ear, Nose, and Throat Society, Reading, Pennsylvania, was held on March 15, 1944. Dr. William A. Lell of Philadelphia gave a lecture on "The larynx" accompanied by lantern slides and motion pictures.

At the April meeting of the Cleveland Ophthalmological Club, Dr. J. C. Gemeroy of Detroit, Michigan, was the guest speaker. The subject of his presentation was "External diseases of the eye," illustrated by some excellent colored slides of the various external diseases. The report of an interesting case of "Melanosarcoma of the ciliary body" was given by Drs. Paul Motto and James Greetham.

At the meeting of the Washington, D.C., Ophthalmological Society held April 24, 1944, the following program was given: "Relationship of German measles to congenital ocular diseases" by Dr. Benjamin Rones; a panel discussion on "Simple glaucoma" by Drs. Edward J. Cummings, Louis S. Greene, and John W. Burke, who spoke on "Early diagnosis," "Cases with nocturnal pain," and "Choice of operation," respectively. Mrs. Helenor Campbell Wilder held an exhibit on "Granulomas on the eye and adnexa" from the Army Medical Museum. Other contributions were made by Dr. Ronald Cox on "A case of nodular episcleritis," Dr. John R. Lloyd on "Old retinal detachment with visible peripheral tear," Dr. C. R. Naples on "A case of circinate retinitis," and Dr. Richard Wilkinson on "Macular lesion."

The Illinois State Medical Society held its one-hundred-and-fourth annual session in Chicago, May 16th to 18th. Dr. Harold Gifford, Jr., of Omaha, spoke on "The more common lacrimal problems."

At the ninety-first annual meeting of the Medical Society of the State of North Carolina, held May 1st to 3d, Dr. James W. White discussed "Ocular muscle paralyses—their diagnosis and treatment."

Among the speakers at the twenty-fifth annual meeting of the Virginia Society of Ophthalmology and Oto-Laryngology, April 29th, was Dr. John H. Dunnington, New York, who spoke on "Complications of cataract extraction."

The West Virginia State Medical Association held its seventy-seventh annual meeting on May 15th and 16th. Dr. Francis H. Adler, one of the participants in the program, presented a paper on "The role of exophthalmos in differential diagnosis and treatment of Graves's disease."

Dr. Albert D. Ruedemann of Cleveland was among the speakers at the eighty-fifth annual session of the Kansas Medical Society, May 10th and 11th. The title of his paper was "Headaches and head pains of interest to the general man."

At the one-hundred-and-fifty-second annual meeting of the Connecticut State Medical Society Dr. Maynard C. Wheeler spoke on "The measurement and treatment of strabismus in children."

The Pan-American Congress, scheduled to meet in Montevideo in November, 1944, will meet instead in November, 1945.

The next annual meeting of the Southern Medical Association will be held in Saint Louis, Missouri, November 13-16, 1944.

At the meeting of the Reading Eye, Ear, Nose, and Throat Society, Reading, Pennsylvania, held on April 19th, Dr. George P. Guibor of Chicago spoke on the following subjects: "Practical points in the diagnosis of motor disturbances," "The use of prisms in the diagnosis and treatment of motor disturbances," "The use of atropine in the diagnosis of motor disturbances," and "Indication for surgery after nonsurgical treatment." In addition Dr. Guibor conducted a squint clinic. Mr. Austin B. Belgard of Chicago read a paper on "Optical centers and their relationship to fusional amplitude."

Personals

Dr. Wendell L. Hughes and Dr. Willis S. Knighton have been appointed associate clinical professors of ophthalmology on the staff of the Columbia University College of Physicians and Surgeons.

Dr. William Thornwall Davis has been chosen as an honorary consultant to the Army Medical Library, Washington, D.C., and received a certificate upon acceptance of this honor.